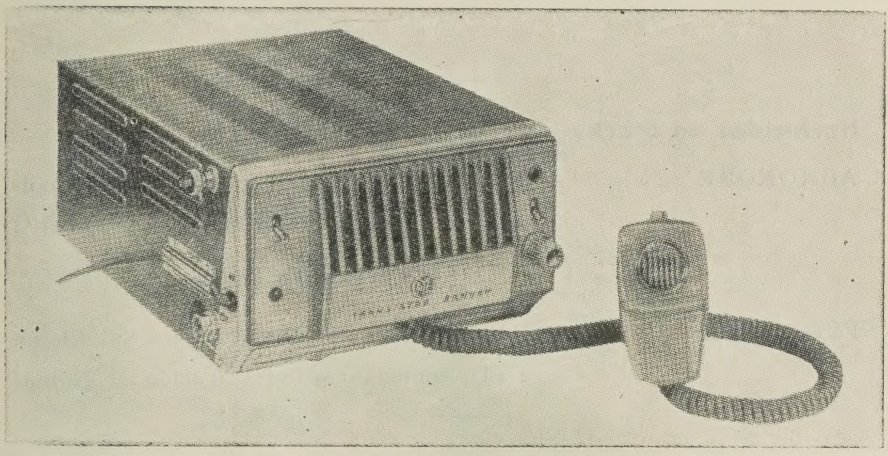
REVUE AGRICOLE ET SUCRIERE DE L'ILE MAURICE

VOL. 40 - MAI - JUIN 1961 NO. 3

Soyons indépendants...

avec le Radiotéléphone PYE 2007.



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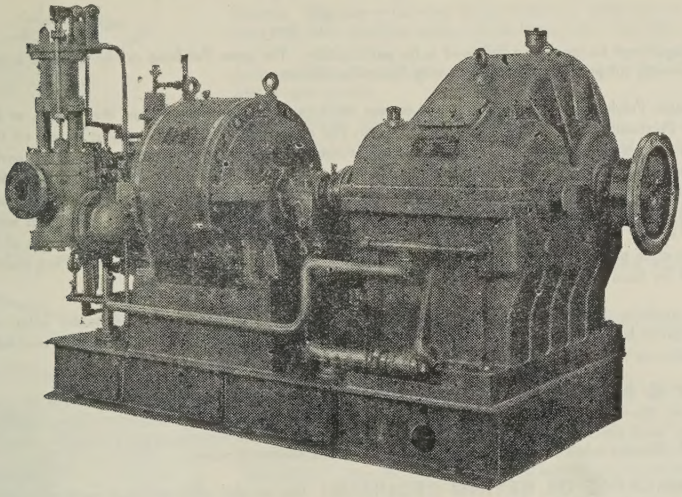

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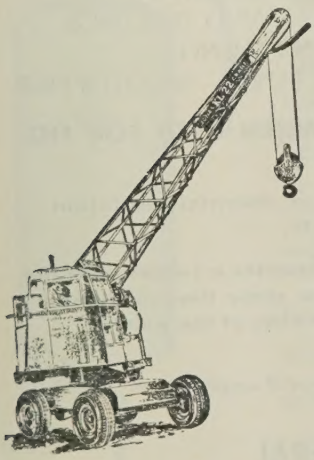

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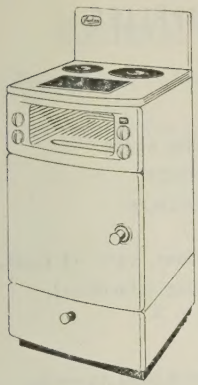

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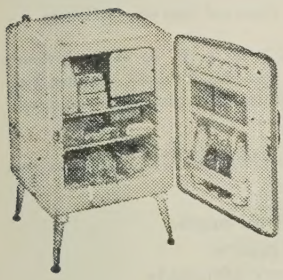

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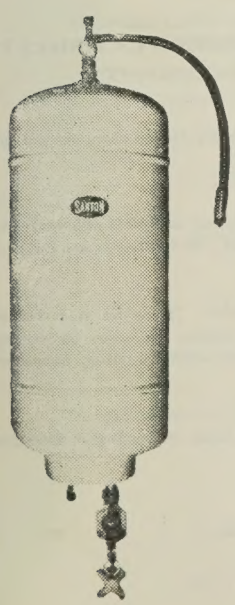

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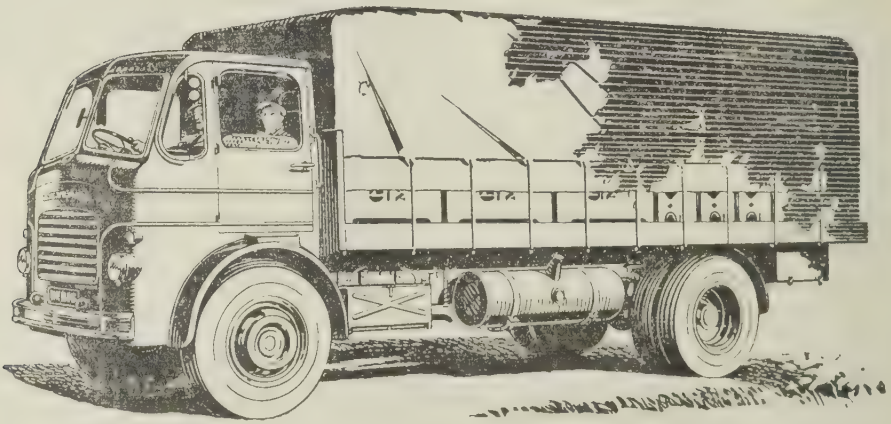

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1961

NOTES ET ACTUALITÉS

Cane diffusion successful in Hawaii

Continuous diffusion of sugar cane is practical and the design of a full-scale commercial unit is well advanced.

This is the report released recently by American Factors Associates, international sugar consultants who participated in the two-year Hawaiian research study on the project through Kekaha Sugar Co., one of their affiliated plantations. The pilot operation was jointly conducted by the Experiment Station, Hawaiian Sugar Planters' Assn., Kekaha, and several suppliers of equipment.

M. H. McAlister, factory superintendent at Kekaha and one of the men who has worked most closely with the project, has expressed the opinion that there would be one or more diffusers operating in Hawaii within the next two years. There are other reports that a number of sugar areas are investigating diffusion and may soon place orders for equipment.

The highlights of the Hawaiian cane diffusion study are :—

It is practical to undertake continuous diffusion of sugar cane with commercial-type machinery now available.

Juices produced are equivalent in quality to milled cane juices.

Economies of this type of processing appear favorable on the following points :—

1. Higher extraction (97½% appears readily obtainable in commercial operation).
2. Capital investment in new equipment should be about 20% lower than a mill train.
3. Power requirement for operation is less, estimated at one horsepower per ton of cane per hour.
4. Maintenance costs are probably one-half of those required for a mill train.

Usage inattendu de l'eau sucrée

Le Département de l'Agriculture des États-Unis et la Station Expérimentale d'Agrumiculture de Floride ont trouvé 6 variétés de porte-greffes pour agrumes qui se sont révélées résistant au « burrowing nematode » *(Radopholus similis)*. Cette information a eté publiée le 18 octobre dernier à Washington.

Des greffons et des pépins de ces 6 variétés sont actuellement multipliés par les pépiniéristes et l'on pense que de jeunes arbres de pepiniere greffés sur porte-greffes résistants seront disponibles pour les agrumiculteurs dans 2 ou 3 ans.

Le « burrowing nematode », anguillule parasite d'environ 0,06 mm de long, est l'agent de la maladie connue sous le nom de « Spreading decline » qui cause le dépérissement des agrumes en Floride et réduit d'une façon considérable la production de fruits. Bien que ce déclin ne tue pas les arbres, la pousse de ceux-ci est faible. Les arbres fleurissent à profusion, mais ne produisent que peu de feuilles et peu de fruits. La taille des fruits est également réduite.

Près de 4400 hectares de plantations d'agrumes en Floride sont envahis par le « Spreading decline ». Depuis 1956, date à laquelle commença la recherche de porte-greffes résistant aux nématodes, près de 5 millions de dollars ont été dépensés pour lutter contre cette infection.

Le déclin commence habituellement par quelques arbres et graduellement s'étend aux arbres voisins, du fait que les nématodes se meuvent dans le sol vers les racines des arbres sains afin de s'y nourrir. Le programme de lutte consiste dans l'arrachage des arbres atteints suivi de leur destruction par le feu et par le traitement du sol avec le nématocide D.D.

Quant à la possibilité de traiter le sol avec un nématocide chimique, il semblerait que tout dernièrement des résultats inattendus aient été obtenus par l'irrigation avec de l'eau sucrée, celle-ci agissant sur le « burrowing nematode » non comme toxique mais comme déshydratant, la déshydratation se soldant rapidement par la mort de l'individu.

Une hispine s'attaque à nos palmiers

On aura remarqué un peu partout dans le pays l'aspect triste des palmiers indigènes, *Dictyosperma*, dont les feuilles sont lacérées, tombantes, noirâtres. Ce n'est pas une maladie, mais les effets des attaques d'une hispine, le *Brontispa limbata* Waterh. qui serait indigène à Maurice et à Rodrigues d'après M. J.A.E. Orian, entomologiste du Département d'Agriculture. Le *Brontispa limbata* est un petit coléoptère, mince et allongé, adapté à son habitat naturel entre les folioles du palmier où l'insecte évolue à partir de l'œuf, par la larve et la pupe jusqu'à l'adulte. Les larves et les adultes se nourrissent du parenchyme des feuilles. Sous des attaques massives les feuilles se dessèchent et l'arbre dépérit. C'est surtout après le passage de cyclones violents que ces attaques sont sérieuses, grâce sans doute à un déséquilibre biologique.

On peut contrôler les dégâts de ces insectes en faisant des pulvérisations à intervalles de quinze jours avec du D.D.T. mouillable à 0.1%, ou avec le dieldrin à 0.025% tous les mois pendant un certain temps jusqu'à rétablissement de l'équilibre biologique.

Au Département d'Agriculture

M. M. D. ffrench-Mullen, directeur-adjoint, qui était parti en congé en février est retourné en mai d'une croisière en Extrême-Orient. Au retour il s'est arrêté une huitaine de jours à Singapore d'où il a rapporté des plantes ornementales qui seront mises en place au Jardin des Pamplemousses.

M. R. B. J. Deane, *Tea Officer,* a passé au *Tea Control Board* comme *Manager* et Secrétaire. M. D. N. Andrews qui lui succède aura charge de la Section du Thé et s'occupera à l'avenir du développement des terres de la Couronne destinées à cette culture. Les travaux de recherches appliquées seront confiés à un agronome.

C'est M. B. D. Roy, B.Sc Agric. (Wales), Dip Agric. (Maur.), qui a succédé à M. W. A. Wright, B. Agric., Dip Agric. (Cantab.), A.I.C.T.A., au poste de *Senior Agricultural Officer* en charge de la Section agricole. Avant sa promotion M. Roy était professeur d'agriculture au Collège d'Agriculture.

M. R. Burrenchobay, B. Sc (Edin.), a été promu au poste de professeur de chimie au Collège d'Agriculture à la suite du retrait de M. J. René Lagesse. M. Burrenchobay était depuis 1951 *Assistant-Lecturer* de chimie.

M. Jacques d'Espaignet, lauréat du Collège d'Agriculture en 1960, qui a été autorisé à faire des études d'ingénieur-mécanicien en Europe, a été admis au Royal Technical College de Glasgow. Il quittera le pays en août prochain. Entretemps il est employé au Département d'Agriculture, Section horticole.

M. J. Manrakhan est sorti premier de la promotion 1961 du Collège d'Agriculture. Les candidats suivants ont aussi obtenu le diplôme du Collège : MM. H. Bernon, L. K. Dulloo, C. Gauthier, G. Lallmohamed, S. Marie-Jeanne, R. Montocchio, J. P. Randabel et H. Viney. M. Manrakhan espère être admis à l'Université de Reading pour se perfectionner en agriculture et en économie agricole.

M. L. Li Pi Chan, employé à la Section du Génie rural, a obtenu une bourse du Commonwealth et se rendra en Angleterre en août prochain pour étudier l'agriculture à Wye College.

A l'Institut de Recherches Sucrières

Au cours d'une mission à Madagascar et à la Réunion, M. P. Pélegrin, Chef du Groupe d'Agronomie Appliquée au Centre d'Études Nucléaires de SACLAY, accepta l'invitation de l'Institut de Recherches de séjourner à Maurice du 26 au 30 avril. Pendant ce court séjour, M. Pélegrin visita les stations expérimentales et les laboratoires de l'Institut et fit une conférence au Bonâme Hall sur *les Applications de l'Energie atomique à l'Agriculture,* au cours de laquelle il fit ressortir les possibilités d'avenir qu'offrent les techniques nucléaires dans les domaines de la génétique, de l'entomologie, de la pédologie et de la chimie agricole.

M. J. Bosser, botaniste de l'Institut de la Recherche Scientifique de Madagascar, fut l'hôte de l'Institut de Recherches du 22 au 26 avril dans le but de puiser de l'Herbier des renseignements pour son étude des plantes de la région des Mascareignes.

M. Jean Pierre Lamusse, *Associate Sugar Technologist,* a accepté le poste de secrétaire-adjoint nouvellement créé à la M.S.P.A. Il a quitté l'Institut à la fin de février et a été remplacé par M. Francis Wiehe, ancien lauréat du Collège

d'Agriculture et B.S. Mech. Eng. (Louisiane), qui était jusque-là attaché comme technicien à la sucrerie de Bel Ombre.

M. Arthur Lagesse, *Field Officer*, a accepté un emploi à Bel Ombre à partir du 1er juin. Il sera remplacé par M. Ng Ying Sheung, de Rose Belle où celui-ci occupait les fonctions d'agronome.

M. G. Harvais, *Assistant Plant Breeder*, en congé au Royaume-Uni a demandé et obtenu sa mise en disponibilité des services de l'Institut à partir de la fin de juillet.

M. C. Cavalot a été nommé *Laboratory Assistant* à la division de Technologie sucrière.

M. François Le Guen, *Assistant Sugar Technologist*, a terminé ses études en *Instrument and Control Engineering* au Northampton College of Advanced Technology. Il sera de retour à Maurice au début de juillet.

Les travaux de la Section d'Entomologie sont pour le moment orientés principalement sur la lutte contre les borers, en particulier les borers ponctués. A cet effet plusieurs espèces de parasites ont déjà été reçus de l'Inde. Il faudra quelques années pour savoir comment ces insectes se comportent dans leur nouvel habitat. L'Institut s'est assuré les services du Dr. Ghani du Commonwealth Institute of Biological Control, qui s'est rendu en Indonésie dans le but d'obtenir des espèces spécifiquement parasites du borer ponctué qui est, comme on le sait, originaire de cette partie du monde. Le Dr. Ghani est arrivé sur les lieux de ses travaux au début de mai et s'est immédiatement mis à l'œuvre. Les premiers envois de parasites viennent d'être reçus.

La carte pédologique de Maurice dressée par la Section de Chimie est maintenant à peu près terminée, mais des études complémentaires sont poursuivies. Des études détaillées des sols de certaines propriétés sucrières ont été entreprises à leur requête au siège de l'Institut depuis le début de l'année. Les chimistes des propriétés suivantes y ont travaillé : Constance (M. le Maire), FUEL (I. Rousset), Médine (A. Maujean), Mon Désert-Alma (F. Lamport), Riche-en-Eau (P. Hoareau) et St. Antoine (S. North Coombes).

Au cours d'une réunion organisée par la M.S.P.A. au Centre de Traitement de Belle Rive le 12 mai, à laquelle assistaient près de 150 employés des champs et planteurs, M. Robert Antoine, pathologiste, parla des conditions à observer pour l'établissement de pepinières de cannes à sucre après traitement thermothérapeutique.

La saison d'hybridation des cannes commença le 7 mai, c'est-à-dire deux semaines plus tard que l'année dernière. Afin d'effectuer tous les croisements en serre, 675 marcottes avaient été placées dans les champs au 20 mai ; ce nombre comprend 70 géniteurs différents. A cette date, 9 croisements avaient été effectués comparativement à 18 en 1960. Signalons un fait peu commun chez les cannes ennoblies : la CB 38-22 fléchа le 16 janvier, ce qui permit d'effectuer le croisement CB 38-22 x S. *spontaneum*, dont on a obtenu 55 seedlings.

M. A. Guy Sauzier au Commonwealth Producers' Organisation

Le *Commonwealth Producers' Organisation* a renouvelé son bureau au début de mai. Lord de la Warr a été élu président, M. Donald Russell, M. P., a été réélu directeur et Lord Colyton et M. A. Guy Sauzier directeurs-adjoints. M. Sauzier est membre du Comité exécutif de l'Organisation depuis deux ans qu'il représente à Londres la Chambre d'Agriculture de Maurice.

Rappelons que M. Sauzier a fait une visite de quinze jours à Maurice au courant du mois de mai pour une prise de contact avec la Chambre. Par la même occasion, Sir Philippe Ratfray, ancien représentant de la Chambre à Londres, faisait aussi visite au pays après une absence de six années.

Sur les propriétés sucrières

A la fin de mars M. L. N. Austin, administrateur de la propriété *Highlands*, a pris sa retraite. C'est M. Gaëtan Langlois, chef de culture de Sauveterre au Grand Port qui lui succède. En même temps que M. Austin, M. A. E. Bérenger, Dip. Agric. (Maur.), R. A. C., directeur de cette sucrerie, se retirait aussi après une longue et féconde carrière. Il aura pour successeur M. A. Davidsen, Dip. Agric. (Maur.). M. Roger Bax, jnr. Dip. Agric. (Maur.), B. S. Eng. (Louisiane), qui vient de retourner de Bâton Rouge à la fin de ses études professionnelles a été nommé technicien de la même sucrerie.

M. René Noël, A.R.T.C. hons (Glasgow), A.M.I. Mech. E., Dip. Agric. (Maur.), qui a été lauréat du Collège d'Agriculture en 1944 et qui fit ensuite des études d'ingénieur-mécanicien au Royal Technical College de Glasgow, a été nommé directeur de la Compagnie sucrière de St. Antoine à partir du 1er mai.

M. Peter North Coombes, Dip. Agric. (Maur.), assistant-chimiste à la sucrerie de Réunion, a quitté le pays le 11 mars dans le but de s'établir à Perth, en Australie Occidentale. Il est employé dans les laboratoires de chimie agricole du *Commonwealth Scientific and Industrial Research Organisation* (C.S.I.R.O.).

Inauguration d'une nouvelle usine à thé

Le 4 juin Son Excellence le Gouverneur inaugurait une nouvelle usine à thé. C'est celle de "Mare Anguilles" près de Chamouny, à la Savane, appartenant à "The Savane Tea Industry and Land Development Company Limited", qui est dirigée par MM. Paul Adam et Jean Dupont. La capacité initiale de production de cette usine est de 250,000 lb de thé par an. Elle travaillera pour l'exportation ; les premiers échantillons ont déjà été favorablement accueillis sur le marché de Londres. La compagnie gère une superficie déjà productive de 180 arpents et recevra les feuilles d'environ 70 arpents appartenant à des planteurs.

THE MEADE REPORT — A READER'S COMMENTS

22.5.61

Dear Mr. Editor,

You may consider it somewhat strange that I should be addressing you on the Meade Report. It is several weeks since it was published but, apart from a letter dealing with the medium of education, I have no recollection that it has been objectively reviewed in all sections of the press. As a best seller it has attracted widespread attention. It is surprising, therefore, that so far no individual has felt inclined to comment on the issues placed before us. If my jottings can induce those more competent than myself to express their views, they would have served their purpose.

I have sometimes wondered whether 1961 will go down in our history as merely the year of the cyclones. Within a decade — by then there may well be another important and far-reaching report commending our attention — only a few will associate it with the visit somewhat too brief of Professor Meade and his colleagues to our shores. Nevertheless, the Meade Report has already become a by-word to most of us and rightly so since it points the way clearly and unequivocally to our economic progress, offers us the opportunity to stand on our own feet and, what is perhaps more rewarding still, promises us the satisfaction that comes of achievement however modest this may prove to be by comparison to that of peoples in more fortunate lands.

By any standard the Meade Report is an outstanding and momentous work and, although we should not blind ourselves to its failings and omissions, we should I think acknowledge outright that, as a thesis, it answers admirably to the terms of reference which its authors were given. It would be a tragedy indeed if it were allowed to be ignored in any of its essentials or mutilated for political expediency. In this connection it might be useful if Professor Meade were to be commissioned to report regularly on the progress achieved in the implementation of his recommendations. This might not only save us the expense of another mission in years to come but, more important still, ensure that no misunderstanding does arise. Such a project might well be financed out of C. D. & W. Funds and would certainly instil greater confidence overseas and especially in those from whom we would welcome a degree of assistance.

From my own point of view, that of a man of the street, one of the most important attributes of the Meade Report is that it has brought within my grasp a clear and vivid picture of our economic problems without in any way baffling me with irrelevant matter, learned dissertations and abstruse conclusions. For this alone the Meade Mission deserves our thanks. A well informed public is

essential to the survival of free democratic institutions and it is regrettably unfortunately true that the Mauritian public, loafers and taxpayers alike, has seldom been in the happy position of being able to get at the facts without having to play blind man's buff. Far too often in the past have matters of vital importance been inadequately presented to us. The penury of facts, sometimes their trappings and on occasion their irrelevance, lead inevitably to muddled thinking and to apathy. These are luxuries that we can no longer afford, and I trust that Professor Meade has set a standard which all, in duty bound, will be eager to emulate.

In broad outline the Meade Report sets us three objectives :— the diversification of agriculture, the development of industrial activity and the fullest use of available resources. Professor Meade and his colleagues do not stop there, however, and define very clearly the conditions which are essential to their attainment, and the most important of these is — Titmuss notwithstanding — that which is least talked about, namely, the policy of wage restraint. I shall observe this convention only in so far as it does not require me to conceal that Professor Meade's arguments in this respect have convinced me that it is a fundamental postulate.

Every Mauritian shares Professor Meade's concern at our over-dependence on the sugar cane and would welcome wholeheartedly any measure of relief from this great weakness in our economy. Granted all this, I do not believe that Professor Meade is right in recommending measures " to restrain too rapid a growth in the output of sugar ". With due respect to him I must confess that all his arguments have convinced me that the duty he recommends should be imposed solely with a view to increasing sugar yield per acre as much as we can, as fast as possible, by all the means at our disposal, and especially by the use of irrigation. The duty would see to it that marginal lands were put to other uses and any fall in the price to the producer through an increase in production would speed up the process. Just as important too we would be giving the industry greater resilience, providing, albeit temporarily, much needed employment for men who are now unemployed, and, last but not least, we would not be putting out of jobs men now gainfully employed in sugar production pending their absorption in industry or in other fields of agriculture. The sugar industry has served the country well and can serve it still better. Why kill the goose that lays the golden eggs ? It has been badly treated enough in the past. Even to-day— while Mac Alpine digs up the country-side, auto-bahns have first priority, and no one knows whether Eau Bleue leaks or not — irrigation water has still to be provided for at least 30,000 acres in the North alone.

Comprehensive as it is, the Meade Report does not devote much space to irrigation. In that it recommends the creation of a Water Resources Authority and is concerned with the development of our agricultural and industrial resources, one would have expected it to contain more definite and uncompromising recommendations regarding irrigation. Had the Meade Commission postponed their visit for a year, it might have been more inclined to do so and

Professor Meade was certainly left under some misapprehension on that subject. The development of irrigation over the last fifty years has been anything but rapid and a mere Rs. 22 millions in the 5-year plan — 6% of the total planned expenditure — when at least a fifth of the cultivated land is marginal through inadequate rainfall, can hardly be regarded as spectacular, especially as the sugar industry will be contributing some Rs. 14 millions a year to public revenue. The productivity of our drier areas must be raised irrespective of the crop they carry, and there should be no impediment to the necessary irrigation works being completed in the next four or five years if we were to go about it in a realistic manner. It is not only the sugar industry which would benefit from this, but agriculture generally, and more particularly such crops as tobacco, potatoes, tomatoes, vegetables of all sorts as well as dairying and beef production. Indeed the most obvious and rapid way of ensuring a sound and healthy diversification of our agriculture is by the rapid development of irrigation, and the proceeds from the duty on sugar should be devoted to that end. They would, for some years at least, be profitably employed. We are plagued by cyclones as well as by droughts and if we cannot prevent wind damage we can eliminate losses from drought. Uncle Harry is positive as to this and on numerous occasions over the last two months he has bellowed with feeling : "There is water galore, but you let your crops die while it runs to waste".

It is not my intention to review in detail here the many important recommendations relating to the development of alternative crops. They will have commended themselves to all who have read the report. I should nevertheless comment on several aspects of the problem in that particular field. First and foremost is that of soil erosion. The report draws attention to it very forcibly and everyone will readily acknowledge that it is an urgent one which should be tackled with energy. In this connection the publication of rules on the Tea Industry is indeed a timely measure and it is to be hoped that the Tea Board will lose no time to put a stop to the malpractices which have so far gone unchecked. As regards erosion elsewhere than in tea, we will doubtless have to await the necessary legislation to be enacted but this should be no deterrent to the far-seeing planter to take now what steps may be necessary.

If the report deals forcibly with soil erosion from run-off it does not mention erosion from encroachment by townships. Curepipe, Vacoas, Quatre-Bornes, Rose-Hill and Beau-Bassin are daily encroaching upon good agricultural land and it does not seem that there will be an end to it unless something positive is done to bring it to a stop. In this connection one need hardly draw attention to the handsome profits made by speculators whose job it is to carve up the land outside town boundaries for sale at a handsome profit. Could not their activities be controlled so that they would benefit our treasury and help subsidise the development of say, the tea industry or, better still, municipal housing programmes? The Meade Report makes a number of references to the price of land and the inflationary trend in land prices must have come to their notice. If so, is there any sound reason for not taxing such capital gains? And if this were a reasonable proposal, would it not be equally reasonable for agri-

cultural land within town limits to be assessed for rates more favourably than is the case at present?

Of the alternative crops listed by Professor Meade tea is obviously that which offers the best prospects of rapid development, and the cost of establishment, which is almost half as much that of establishing tea in Nyasaland and appreciably higher than in Kenya and presumably India and Ceylon, is ample justification for generous assistance to that industry. It is somewhat puzzling, therefore, that the visit of the Meade Mission should have coincided with measures which curtailed some of the assistance — by no means over-generous — from which the industry had benefited up to then. As to the proposal for a Tea Development Authority I am afraid that the arguments put forward by Professor Meade and his colleagues do not carry conviction very far. Are not the functions which it is proposed it should have, functions that can be efficiently discharged by the Tea Board, the Extension Service of the Department of Agriculture and the Mauritius Agricultural Bank?

If the proposal for a Tea Development Authority seems superfluous, that for an Agricultural Marketing Board is not. Its establishment has been mooted from time to time and if there is nothing new in the Meade recommendation, the outline of policy that such an organisation should follow is worthy of attention. To be effective, the Board must not only accept all scheduled produce offered with due regard to the interests of producers and of consumers alike. But to do so it must, especially in Mauritius, be in a position to build up stocks for disposal during periods of scarcity. Storage is therefore likely to be an important aspect of its functions and it is surprising that the Report makes no mention of the more advanced techniques in this field, more particularly since they would be eminently suited to the processing of perishables.

The Meade Report has also referred to the rehabilitation of the Board of Agriculture, Fisheries and Natural Resources. In view of several other recommendations of the Mission, there may be merit in the view that it should be as independent of the Ministry of Agriculture as possible and that its functions should include also those of the proposed Water Resources Authority and of other boards which are not marketing boards. This is surely a matter which deserves careful consideration. There is a very pronounced tendency the world over for a plethora of boards and there is much to be said for merging them where this can be done especially in countries where managerial and administrative ability are scarce commodities.

As a Hornby enthusiast and one who, as a boy, used to ride the foot-plate during the school holidays, the rapid disintegration of the railways has been a source of much disappointment. For many years now I have been perhaps alone of my generation to have favoured their rehabilitation. I should be rejoicing, therefore, that the Meade Commission should have been "inclined to doubt whether the change over from rail to road is really an economic proposition". This I am unable to do since it is apparent that the Commission has been led to believe "that the governing factors were the value of a property

occupied by the railways which could be released for other purposes and the heavy cost of future replacements of railway equipment ". As a tax-payer who has been kept in the dark about this major issue — it was rumoured at one time that defence considerations had to be taken into account — I find some difficulty in accepting that the facts were correctly represented to Professor Meade. Doubtless the railways control much valuable property ; but a lot of this could be put to better use without closing them especially as on balance, the railways own property which is of little value, e.g. Quatre Cocos Station, or of no value whatever, e g. the Grand Robertson Canyon. It is also undeniable that little provision was made over past decades for the renewal of the equipment. I have much sympathy for Professor Meade's informer. He must have found it difficult indeed to justify the new trunk road, as well as the long established policy of running down the railways to the point of no return.

It is a pity, however, that Professor Meade does not tell us whether we have passed the point of no return or not. He is probably hopeful that the commission appointed in 1958 will eventually be in a position to answer this question. Let us hope that it will not wait until that point is effectively past before doing so, but the recent uprooting of what was left of the Moka line leads one to think that it is already too late. What a sad and pathetic story this ; but the end is not yet and we shall all come to regret our past incompetence and negligence. We can already discern the writing on the wall : road licences are more expensive and import duties on vehicles have been raised ; the cost of road maintenance is likely to increase appreciably once the sugar traffic is put on the roads ; and the likelihood of increased duties and taxes to meet this extra burden is already a certainty. At times we have been too free in our criticism of the losses experienced by the railways. They gave us at least a fair measure of the cost to the community of transporting our sugar, our schoolchildren and our goods and chattels. Happy indeed will be the man who, ten years hence, will be in the fortunate position of being able to do this.

If the development of industrial activity is to prove successful, power must be cheap and plentiful. There is little in the Meade Report which suggests that industrial expansion will not be hampered because of the lack of cheap power, given the future demands of water for irrigation and the Central Sewerage Scheme and the rapid increase in the domestic consumption of both water and electricity. On the lighter side the Report gives its blessing to an ingenious scheme for obtaining electrical energy from the sea after noting in a preceding paragraph that distribution losses were exceptionally high. The proposal, which Professor Meade considers ingenious but barely expedient, would use sea water through low-head turbines — very low-head at that judging by our tides — to generate electricity. Would it not have been more ingenious to propose the more general use of low-head turbines to convert the millions of gallons of water which is supplied daily to Quatre-Bornes, Rose-Hill and Beau-Bassin by piping the raw water they require to filterbeds near Candos? My uncle Harry says that this scheme is feasible, but he goes mad whenever mention is made of water utilisation to him. In his view there is water galore. He would like to see

dams in echelon, wherever they can be built, on all our rivulets, streams and rivers so that flood water can be stored and the inflow regulated. Above all he cannot see any sense in hydro-electric stations unless such schemes are combined with i rigation schemes. I am sure that he would have rejoiced in the proposal for a Water Resources Authority.

If the Meade Report is not very informative about hydro-electricity it is almost silent on other forms of electricity. The Central Sewerage Scheme is to cost the country a mint of money but until now there has been no pronouncement as to its disposal. We have heard a lot about ponds but there have been rumours since that the traditional method of dumping everything into the sea was gaining support. In India, Italy, Germany and elsewhere there is a growing tendency for the sewerage to be converted into methane gas which is used to generate low pressure steam. As a passing thought it might have been wiser to finance a pilot methane gas scheme — in Port-Louis perhaps — than spend money on the harnessing of the tides. There are also generating plants in our sugar factories which are idle for much of the year. The Meade Commission would have done us an additional service if it had enquired into this also. In this and other matters the Meade Commission appears to have been discreet to a fault. It may have overlooked that it is no comfort to be told that one learns by one's mistakes.

No one who has read the section of the Report on Industry will have failed to be impressed by its comprehensiveness and value but there are, nevertheless, a number of blanks which will also puzzle the reader. The possibility of alcohol manufacture, for instance, is a case in point. Professor Meade and his colleagues would strongly support a scheme for the production of alcohol if overseas markets could be found, but no mention is made of the local market. In the Union of South Africa petrol is admixed with alcohol and, although cars are not particularly responsive to the mixture, there have been no report of the practice being discontinued. Are not the petrol companies sufficiently enterprising to be interested in erecting and operating a rectifying plant in Mauritius if we were to adopt such a scheme? The chances are that some would be, especially if their sales of petrol were to increase sufficiently to make this worth while. There is of course the question of revenue, but this may not be as difficult as all that. What is of immediate concern is that a source of power, labour and wealth, worth at least Rs. 15 millions — somewhat more than what the export duty on sugar will bring in — is annually poured on our cane fields along with the fertilizers with which it is admixed.

The recommendation for an Industrial Development Board and a Government Advising Committee also seems to require comment. The functions assigned to the Board do not appear compatible with each other and some of the officials designated to sit on the Advisory Committee would be unsuited by temperament or training for that sort of work. To my mind there should be no Advisory Committee but an Industrial Authority, which would fulfill the functions of the proposed Industrial Board and would exercise control over an active profit-making Industrial Corporation established by statute. It should fall to the Authority to consider applications for concessions and assistance from industry, compile

the necessary industrial records, advise on industrial legislation, investigate new possibilities, and grant loans. It should be the function of the Corporation to manage public owned or public controlled concerns and to watch over Government interests in concerns in which it would have a minority interest. It would administer the trading estate if need be but it should above all be a progressive profit-making organisation untrammelled with the vetting of projects and the like.

As regards the granting of long term loans to industry there is perhaps merit in the view that Government should favour active participation with private industry through its Industrial Corporation rather than lending the money. This would serve two ends; it would ensure a more objective approach and would be more flexible. It would enable Government at any time to realise its holding in whole or in part by sale to the public, thus encouraging the participation of the community at large rather than favouring the well-being of the borrower. It might be borne in mind that Government would be investing public funds on bebalf of the community and it seems only right that the community should be offered direct participation in due course. As a consequence of such a policy, the "Bourse" would become more of a stock-exchange than it is at present and would thus serve a more useful purpose than it does now.

There is no reference in the Meade Report to our great weakness for "Credit" rather than "Cash" transactions. This tendency of ours to get almost everything on "tick" may have its good points but it also has its very bad points. It is strange that Professor Meade has not come out in condemnation of such a pernicious practice and suggested measures to eradicate it. Far from encouraging people to save it has encouraged squandering and promises well to enslave those who have succumbed to its temptations. As I have already remarked, the Meade Commission appears at times to have been discreet to a fault. We have not been warned, for instance, that we may be endangering our future by the frittering away of our agricultural land, and above all there has been no call to our leaders, in whatever fields they may be, to help restore the confidence which is essential to our emergence as a free and hard working people able to stand on its own feet.

I would be presuming on your tolerance and that of your readers if I were to comment on the many other aspects of the Report. It was my purpose to dwell on what appears to me to be some of its major failings, but I shall have been grossly misunderstood if the impression I have given is one of censure. For all its failings and omissions the Meade Report is a far-reaching document for which we should be grateful.

A final point before I pick up my fishing rod again. Professor Meade has done us a great service in recommending the setting up of an "Organisation and Methods" division. He would have done us another if he had recommended the employment of "Time and Motion Specialists". Half of us spend our time killing motion, while the other half kills time moving to no purpose.

Yours truly,

"Pensioned-Pol".

MEMORANDUM

BY

THE MAURITIUS CHAMBER OF AGRICULTURE ON GOVERNMENT'S PROPOSAL TO INTRODUCE AN EXPORT TAX ON SUGAR

On behalf of the planting community of Mauritius, the Mauritius Chamber of Agriculture wishes to enter the strongest protest against the introduction of a 5% ad valorem tax on sugar exports which is intended to discourage the the expansion of the Sugar Industry and to cover the Colony's anticipated budget deficit.

2. The Chamber considers this tax unfair, unjustified and detrimental to the interests of the Sugar Industry and to the economy of the Island as a whole.

3. The Sugar Industry, as the Meade Report itself testifies, is and will always remain the backbone of this Island's economy and the very sheet-anchor of its survival. As such, it should receive the greatest support of the inhabitants of Mauritius and of its Government instead of being the object of discriminatory measures which aim at jeopardising its efficiency and discouraging its development.

4. The Chamber has always supported and will always support the creation and expansion of secondary industries in order to diversify the island's economy, to provide more employment for its inhabitants and to increase its national income. The history of this Island has shown, however, that no other agricultural industry has been able to play other than a marginal role in the economy of Mauritius. In the circumstances, it would be the most grievous error to strike at the fabric of the Sugar Industry, even before any of the other secondary industries has proved capable of contributing significantly towards the economic life of this country.

5. The advisability of proceeding with the expansion of the Sugar Industry has been questioned by the Meade Mission on the grounds of market limitations. It must therefore be recalled that Mauritius is a signatory to the International Sugar Agreement, which imposes quota limitations on international exports, and to the Commonwealth Sugar Agreement which restricts shipments to preferential markets. International quotas are revised at periodical conferences under the auspices of the United Nations and, so far, Mauritius has benefited by progressive increments to its quota which is now higher by 40,000 long tons. Provision is made in the Commonwealth Sugar Agreement (Art. 8) for an up-

ward revision of quotas in the light of consumption levels in preferential markets and of "export performance and other relevant factors" in respect of the exporting territories. For years now, Mauritius has been building up a case for privileged treatment whenever a revision of quotas takes place. This case is based on its special demographic problem, its export performance and its production capacity. Other Commonwealth countries, notably Australia, the West Indies and Fiji, are no less anxious to obtain an increase of their quotas and are trying to build up a case for similar treatment. Some non-exporting Commonwealth territories in Africa and in the Caribbean have openly intimated their intention of claiming a share in any increased quota that might eventually be granted to the parties to the Commonwealth Sugar Agreement. In the circumstances, the Chamber considers that if the Government of Mauritius subscribes to a policy designed to limit the expansion of the local sugar industry, the chances of our obtaining an increased quota under either of the above Agreements will be considerably lessened. Our competitors in the Commonwealth will be quick to point out the illogicality of allocating quota increases to a territory which has voluntarily decided to call a halt to its expansion and will contend that such quota increases should be distributed to territories which have not subscribed to such a policy. The Chamber therefore considers that Mauritius will be acting against its own interests and will be playing into the hands of other Commonwealth producers.

6. The Chamber strongly disagrees with the Meade Mission's conclusions that, in the case of Mauritius, the only remedy to market limitations lies in production restraint. Our problems are such that the survival of the Mauritian Community is conditioned by greater productivity in all fields, in the first instance in the Sugar Industry, and the only remedial measure lies in the direction of an increase of the Mauritius export quota for which there is every justification.

7. Indeed, far from having reached a stage where burdensome surpluses are accumulating, Mauritius is even now unable to fulfil its present quota obligations. As a result of the 1960 cyclones Mauritius fell short of its overall basic quota by 196,308 long tons. The cyclones of 1960 have been followed by the prevailing drought, the most severe on record in this island and for the second successive year Mauritius will, in all likelihood, be unable to supply its basic quota and take advantage of substantial reallocations from other territories. It will be several years before Mauritius is able to build up the necessary reserve to act as a cushion against future production shortfall including the special stock obligation imposed by the International Sugar Agreement. The Chamber therefore submits that this is hardly the time to check the expansion of the Sugar Industry.

8. We have so far expounded in some detail the ill-effects of a policy aiming at the restriction of the Sugar Industry's development. If it is accepted that the case has not been established for restricting sugar output, the need for a 5% tax disappears completely. We will now turn to the financial implications, immediate and long-term, of an ad valorem tax on sugar exports.

9. The proposal for such a tax was put forward by the Meade Mission with the express purpose of discouraging the expansion of the Sugar Industry. The Mission was satisfied, after having had access to confidential costing figures, that a 5% tax would achieve this objective. Such a proposal, however, was intended to be implemented together with other proposals as listed in paragraph 7 : 24 of the Meade Report, amongst which were a reduction of Company tax from 40 to 30 per cent and the stabilization of wages at pre ent levels. Government has not intimated an intention to proceed with the implementation of these last two proposals and the result is that the impact of the export tax will be considerably aggravated and will have serious and immediate repercussions on the industry, especially in present circumstances.

10. The industry is just emerging from the disastrous consequences of two cyclones which it is having to face without recourse to outside financial assistance. Damage to industrial assets was very substantial and is being made good by available finance and by borrowing. These cyclones have now been followed by a severe drought which will affect a large number of millers and planters to a serious extent. The Cyclone and Drought Insurance Fund is virtually depleted and may not be able to meet its full liabilities in respect of the current crop. The absence of long-term credit facilities and the present scarcity of money will be further aggravated by Government's support of the Meade recommendation to restrict loan finance which had so far been made available to the Sugar Industry by the Mauritius Agricultural Bank. The Chamber therefore submits that the effect of the export tax will be to place the Industry in a position of greater vulnerability. Indeed, a number of planters and millers who have entered into financial commitments will be seriously embarrassed and the effect of the tax on the profitability of marginal factories may lead to their closing down — a step which Government itself aimed at avoiding by the passing of Ordinance No. 5 of 1961.

11. The proposed tax will reduce the price of sugar by some Rs 25 per metric ton and, consequently, the planter will receive at least Rs 2 less for every ton of cane supplied by him to a factory. The tax will have, therefore, the further effect of putting a brake on investment in the industry. The efficiency of sugar factories and the efficiency of planters' cultural practices depend, to a considerable extent, on the capacity of the industry to plough black a substantial proportion of its profits after taxation. Renewal of plant and machinery, the provision of housing for workers, the improvement of lands by planters are costly operations which must be undertaken in order to maintain efficiency. Increased productivity on existing lands can only be achieved by the utilization of new techniques, equipment and cultivation methods which involve still higher capital expenditure. Failure to keep abreast of technical developments will, in the long run, impair the efficiency of the local industry and, therefore, weaken its competitive position on world markets.

12. No other Commonwealth exporting territory — except Fiji — has ever thought fit to introduce a levy on sugar exports for general revenue

purposes. In the case of Fiji, there is an export duty of 8 shillings (Fiji currency) per long ton, which is equivalent to Rs. 5.57 per metric ton. The Fiji duty is, therefore, about one-fifth of the tax which it is proposed to introduce in Mauritius.

13. The Meade Mission stressed the need to provide increased employment for the growing population. The fiscal measure proposed will have, in our submission, the opposite effect on the Sugar Industry. The constant pressure of taxation, rising prices and wage increases on the margin between revenue and operating costs inevitably drive both millers and planters, in their own interests and in the interests of the Sugar Industry, to resort to more mechanization and to the introduction of labour-saving devices.

14. We have shown above how the proposed tax is bound to affect the Sugar Industry and, consequently, the Colony's economy. The Chamber considers that, faced with the necessity of raising more revenue to balance its ever rising expenditure, Government is penalising the most productive section of the community—the planting community as a whole—who, by its persistent efforts and its unstinting labour over so many years, has built up an effcient industry upon which the Island depends for its very existence.

MAURITIUS CHAMBER OF AGRICULTURE,
Port-Louis, Mauritius
15th May, 1961.

THE SUGARCANE MILLERS AND PLANTERS CENTRAL ARBITRATION AND CONTROL BOARD

by

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The Central Board as at present constituted under the Sale of Canes Control Ordinance, has now been operating for twenty-one years, during which time it has done much useful work, not only through its direct action, but also through the orientation it has given to the sugar industry towards better technical methods and better methods of costing and accountancy.

The Board was instituted in 1939 following the 1937 unrest in the sugar industry, to hear and attend to the grievances of planters, to settle disputes in connection with the sale and purchase of canes and to control the activities of all parties concerned in order to ensure harmony among them. The Board is composed of a Chairman, two representatives of millers and four representatives of planters of whom two are representatives of planters producing less than 1,000 tons of canes yearly. The Board regulates its own procedure and may refuse to hear a case which in its opinion is of a frivolous nature. The Registrar of the Board is responsible for the preparation of the work of the Board and for seeing that its decisions are complied with. The office of the Registrar is a division of the Department of Agriculture.

The main functions of the Board are :—

(a) To define the areas from which each sugar factory may draw its supply of sugarcane.
(b) To determine the price to be paid by millers for the purchase of sugarcane from planters.
(c) To arbitrate in cases of dispute between millers and planters.
(d) To control the planting and propagating of sugarcane varieties.
(e) To control the weighing of sugarcane at delivery points.
(f) To calculate the cost of production of sugarcane and the cost of manufacture of sugar.
(g) To fix the rate at which the cost of transport of planters' canes by millers is claimed.
(h) To issue permits to millers to operate their factory.
(i) To issue permits to middlemen to carry on their business and to control their activities.
(j) To register sugarcane contracts.

The delimitation of factory areas as defined by the Board is subject to revision from time to time in case there are new factors that become operative. The price payable by millers for planters' canes is determined yearly on the basis of the sugar recoverable from such canes and other considerations such as the time of delivery of the canes.

The cultivation of the original noble cane varieties which at one time were the only ones cultivated on a commercial scale has been abandoned and all sugar producing countries now have breeding programmes to produce new varieties best suited to the environment. The objective of the programme is to obtain cane varieties having such characteristics as high sucrose content, high yield, resistance to pests and diseases and resistance to drought and cyclones. A good cane variety is one possessing some if not all these qualities. At one time a large number of varieties were cultivated indiscriminately in Mauritius ; most of them have gone out of commercial cultivation and the varieties which may now be planted and propagated are specified by proclamation under Ordinance No. 69 of 1945. Recommendations in that connection are made to His Excellency the Governor by the Central Board in consultation with the Cane Release Committee. A large proportion of the cane production of the Colony is from varieties which have been bred locally. Special mention should be made of the variety M. 134/32 which was responsible to a considerable extent for the bumper crops obtained in Mauritius in the recent past. All the released " M " varieties have been bred and tested by the Sugar Cane Research Station of the Department of Agriculture and its successor the Mauritius Sugar Industry Research Institute. The E. 1 37 variety was bred by Highlands Sugar Estate. This variety gives best results in the wetter parts of the island. However, it is not resistant to cyclones.

In a normal year the average sucrose content of canes exceeds 14% in Mauritius. The other constituents of the cane are 72% water, 12% fibre and 2% soluble impurities. For their own benefit as well as for the benefit of the sugar industry as a whole planters should cultivate canes of high sucrose content. To this end planters should select varieties which are suitable to soil and climate, they should apply the correct amount of fertilizers at the correct time and harvest first the canes which have first reached maturity. The system of cane payment adopted by the Central Board being based on the recoverable sugar in cane encourages planters to practise good agricultural husbandry.

When, as in Mauritius, sugarcane is cultivated year after year in the same fields, it is necessary to return to the soil the plant food which is removed by the crop. In sugar cane cultivation scums and often molasses are returned to the soil in order to ensure continued fertility. Hence the practice of the Central Board to allow to planters not only a share of sugar but also a share of the scums and molasses.

In general sugarcane is weighed by means of weighbridges operated manually. Some factories have installed platform weighbridges fitted with dial

scales and automatic ticket printing mechanisms, which eliminate possible errors in weighing or recording. The testing of weighbridges and the control of cane weighing are carried out by the Central Board under Government Notice No. 92 of 1942.

It is important that canes delivered to a factory for milling should be free of " white tops ", and as free as possible of trash, soil or other extraneous matter. Cases of dispute between millers and planters on this issue are sometimes submitted to the Central Board for arbitration.

When sugarcane is milled, juice is extracted leaving a fibrous residue known as bagasse. Sugar is manufactured by clarifying and concentrating the juice which contains about 13% of sucrose and 2% of substances such as glucose, fructose, organic acids, colouring matters, proteins, fats and waxes. Bagasse contains about 50% fibre, 46% water and 3% sugar. It is used as fuel for the production of steam at the factory boilers. Some factories have a surplus of bagasse of the order of 10% of the bagasse produced. In Mauritius surplus bagasse is being increasingly utilised for the production of electricity for use in urban areas and on as yet a small scale in the production of composts and of animal feeds.

The solid particles in the juice, composed mostly of small pieces of canes and soil, are separated by screening. The juice is then weighed by automatic weighing scales. The juice is weighed before the addition of chemicals. No correction is allowed for suspended solids. The use of weighing scales for juice is governed by Ordinance No. 4 of 1948 and controlled by the Central Board.

The weight of molasses % cane is about 3. Molasses contain on average 35% sucrose and 53 % total sugars. A considerable proportion of molasses is exported in bulk to the United Kingdom and to the United States.

Molasses are also processed locally into alcohol. This alcohol is used in the compounding of rum, in the preparation of perfumes and pharmaceutical products and is exported. Molasses is also used as fertiliser and as an animal feed in admixture with other feeding stuffs. During the war, industrial alcohol mixed with petrol was used as fuel in motor cars and lorries.

Scums are used exclusively as fertilliser ; about 2% is produced on weight of canes.

The quantum of scums and molasses which accrues to planters per ton of canes supplied is two-thirds of the average amount of these residues produced by the factory per ton of cane crushed during the crop period.

The mode of payment of planters' canes varies from country to country but is always such that the proceeds of the industry are so distributed between millers and planters that both make a profit. The chosen method of payment should ensure that the best interests of the sugar industry as a whole are served. The methods in use in the various sugar producing countries of the world for the payment of planters' canes may be classified as follows :—

Firstly, the flat rate method, whereby all canes supplied to a factory are paid for at a price which varies according to the selling price of sugar. Here the quality of the cane is not taken into consideration and the same price is paid to planters who produce canes of a high sucrose content as to planters supplying inferior canes. Such a method is still used in some parts of the world.

The second method which is payment on sucrose content, consists of paying each ton of sucrose in cane at a price which varies according to the selling price of sugar. The third method consists in paying each ton of recoverable sucrose in the cane at a price which varies according to the selling price of sugar. In Mauritius a standard efficiency is taken to calculate the amount of recoverable sucrose. Payment of canes on sucrose content acts as an incentive to planters to produce the maximum amount of sugar per acre, hence the superiority of payment on sucrose content over the flat rate method.

Payment on the basis of recoverable sucrose as practised in Mauritius is no doubt the best method as the value of the cane depends mainly on the quantity of sugar that can be manufactured from it and not on the total quantity of sugar which it contains. At one time the Mauritian planter was paid on the flat rate basis. The planter was given a certain number of kilos of sugar per ton of cane and that amount usually represented about two-thirds of the average amount of sugar which was extracted per ton of cane by the factory where the canes were crushed. Sometimes the planter received less than two-thirds and sometimes more, especially where competition existed between factories. When in 1939 the Central Board was established to control the sale and purchase of canes the enabling legislation laid down that when determining the payment due to planters in return for their canes the Board shall be guided by the principle that the average amount of sugar which planters might expect to receive for their canes would not be less than two-thirds of the amount of sugar which a ton of such canes delivered at the factory might normally be expected to yield. The necessary sucrose content tests and computations in order to arrive at the share of sugar of millers and planters on this basis are done by the chemists of the Board.

The methods of calculation used ensure to planters two-thirds of the amount of sugar which their canes delivered over the crop period would have yielded irrespective of the efficiency of the factory where such canes have been crushed. A factory area is assigned to each factory by the Board, and a given planter may only send his canes to a specified factory But whether that factory is efficient or not does not affect the planter, the two-thirds share of sugar to planters being calculated according to a "standard efficiency" for the whole island adopted by the Central Board.

At the end of each crop, the Board after taking into consideration the results of sucrose content tests and cognate calculations, fixes provisionally the amount of sugar, scums and molasses accruing to each planter or group of planters having entered into provisional contracts. These figures are made available to interested parties who are given the opportunity of protesting against same and of placing their arguments before the Board.

In addition to its administrative and technical sections, the office of the Registrar also comprises an accountancy section which calculates yearly the cost of production of sugarcane of all estates with factories and of a representative number of large and small planters. The cost of manufacture of sugar of all sugar factories is also calculated yearly. These costs are worked out in detail.

Most factories transport planters' canes delivered at outlying weighbridges by road or rail. The expenditure of factories in that connection is re-imbursed by planters at rates which are worked out by the Central Board every year. The average rates so obtained for rail or road transport as the case may be are applied in all cases on sliding scales according to the distance over which the canes have been transported.

The above is an outline of the main activities of the Central Board whose duties are delineated by law. As regards the staff of the Board their duties are mandatory and their objective is to ensure that the decisions of the Board are put into effect with diligence and efficiency.

THE POTATO INDUSTRY OF MAURITIUS

by

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Consumption and sources of supply

It is estimated that about 8,500 metric tons of potatoes are at present consumed annually in Mauritius. Until recently the largest bulk had been supplied by imports. The figures for imports and local production for recent years are given in Table I. These show that imports now account for about 50 % of the local consumption. The imports column in the table contains seed imports as well as potatoes for consumption. The imported seed, it is estimated, amounts to 500 tons per annum.

Table I. *Recent imports and estimated local production of potatoes (Metric tons)*

Year	*Imports*	*Local production*	*Total*
1955	3095	3178	6273
1956	3741	2986	6727
1957	4029	2512	6541
1958	4019	4433	8452
1959	4450	4803	9253

The sources of supply of imported potatoes are shown in Table II.

TABLE II.

Country of Origin	1955	1956	1957	1958	1959	Annual average
South Africa	2359	2603	2517	24	2233	1947
Japan	59	420	952	1514	559	713
Australia	218	10	230	1149	734	468
Reunion	130	394	238	312	200	255
Kenya	99	76	82	543	549	270
Madagascar	55	50	4	417	111	127
Others*	175	188	6	—	60	86
Totals	3095	3741	4029	4019	4450	3867

It can be seen that in normal circumstances South Africa is by far the largest supplier, its share of the market ranging from 50 % to 75 % of the total

*Irregular supplies including such countries as Cyprus, Tanganyika and Portuguese East Africa.

imports in normal years. The year 1958 was exceptional because of the failure of the crop in South Africa. It is in years when South African supplies are short that some other countries make their most substantial contribution to the market though it is apparent that countries like Australia, Japan and Kenya are now entering the picture more strongly and supplying the increasing needs of the island whilst South Africa's contribution remains static.

South African potatoes are cheaper than those from other sources usually being obtainable at about £ 30 or less per metric ton. The c.i.f. values of imported potatoes from the various sources are shown in Table III (a) and (b).

Table III (a). *C.I.F. values in pounds sterling per metric ton of imported potatoes 1955-59.* (Quantities are given in brackets).

	1955	1956	1957	1958	1959	Mean
South Africa	30.5	29.0	29.5	33.7	29.9	30.5
	(2359)	(2603)	(2517)	(24)	(2233)	(1947)
Japan	28.7	31.8	33.2	30.4	34.0	37.6
	(59)	(420)	(952)	(1574)	(559)	(713)
Australia	34.0	53.1	40.0	38.2	35.9	40.2
	(218)	(10)	(230)	(1149)	(734)	(468)
Reunion	45.5	35.5	34.0	39.4	33.3	37.6
	(130)	(394)	(238)	(312)	(200)	(255)
Kenya	33.3	31.0	34.3	31.3	39.8	33.9
	(99)	(76)	(82)	(543)	(549)	(270)
Madagascar	34.7	33.4	33.0	32.5	29.0	32.5
	(55)	(50)	(4)	(417)	(111)	(127)

Table III (b). *Prices per ton averaged out for the full quantity imported 1955-59. Pounds per metric ton.*

South Africa	Japan	Australia	Reunion	Kenya	Madagascar
£ 29.7	£ 32.3	£ 37.4	£ 36.8	£ 30.7	£ 32.2

Table III (b) gives a fairer picture of the price of potatoes from the various sources since certain small high priced consignments, possibly of seed potatoes, tend to inflate some of the figures in the right hand column in Table III (a). Apart from these small consignments some of which have cost over £ 50 per ton, prices have generally been between £ 29 and £ 35 per ton.

Local production

The estimated total tonnage of local production is given in Table I above. Table IV below gives the figures for area under the crop, estimated yield per unit area, and again the final estimated local production for the years 1955-59. These figures are all estimates made by the Extension Service of the Department of Agriculture. Pure stand potatoes and interrow crops grown in cane are included. A high degree of accuracy cannot be expected in these estimates.

Table IV. *Acreage, yield per acre and total production of potatoes.*

	1955	1956	1957	1958	1959	Mean
Acres	819	973	596	1088	1165	928.02
Average yield (tons) ...	3.880	3.067	4.215	4.074	4.123	3.872
Total production ...	3718	2984	2512	4433	4803	3582

The distribution of the local potato industry can be traced by reference to Table V below which gives the estimated acreage under the crop in each district in 1959. The acreage planted each month is also given to indicate the potato season in each of the different areas and for the island as a whole. It can be seen that production is widely distributed throughout the island but at present the chief potato areas lie in the north and west.

Table V. *Acreage planted per month and total acreage per district (1959).*

	JAN.	FEB.	MCH.	APL.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1. Rivière du Rempart	—	—	—	42	39	31	57	—	57	—	—	—	226
2. Plaines Wilhems	—	—	—	—	26	31	5	10	16	37	21	—	146
3. Black River	—	—	—	—	—	63	99	83	42	83	54	—	424
4. Pamplemousses	—	—	—	—	—	26	37	42	23	13	—	—	141
5. Flacq	—	—	—	—	—	2	3	31	37	10	—	—	83
6. Moka	—	—	—	—	—	—	—	16	10	16	16	3	61
7. Savane	—	—	—	—	—	—	—	10	8	52	—	—	70
8. Grand Port	—	—	—	—	—	—	—	—	7	3	3	—	13
TOTAL	—	—	—	42	65	153	201	192	200	214	94	3	1164

There has been a tendency for the crop to be later planted in the last year or two and the planting regime in Table V for 1959 shows this trend markedly compared with previous years. The exact factors leading to later planting are not known but the main reasons may be commercial rather than agricultural. At the same time March and April plantings have been limited by shortage of seed from Reunion and Madagascar.

Since the crop matures in 75 to 90 days it can be seen that local production is available from June until December and later into January in this last year. There is no storage of the crop, so that a good idea of the quantities coming on the market at any given time from local production can be derived from the acreage planted each month. If it is taken that average yields are about 4 tons per acre, then from the 1959 crop there should have been the following quantities of potatoes available from local production in the following months :—

	July 59	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March 60
Tons	168	260	612	804	768	800	856	376	12

Because the fact that potatoes produced locally are not normally stored before marketing, it is to be expected that there would be a seasonal tie-up between local production and imports. Evidence of this tie-up appears in Table VI (a), which shows the quarterly imports for 1958 and 1959. In Table VI (b), the 1959 imports are shown again on a monthly basis. The tie-up is not closer since merchants store a certain quantity of potatoes for varying periods up to a few months. Theoretically, one would expect the demand to be fully satisfied from local production from September to January as regards the year 59/60.

Table VI (a). *Quarterly imports of potatoes in metric tons.*

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1958	919	1891	778	431
1959	1448	1682	1073	248

Table VI (b). *Monthly potato imports in 1959* (nearest ton).

Jan.	Feb.	Mch.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
275	534	639	403	959	321	228	513	332	91	72	85

Agricultural conditions

Soils

The soils on which potatoes are grown are like all Mauritian soils of volcanic origin, of satisfactory fertility and although not ideal soils for potato growing in their physical properties nevertheless suffer no serious disadvantage and are adequate to support economic yields.

Climate

The trade winds are from the south-east and the climate of Mauritius is a function of these winds and the relief. The island has a windward and a leeward side lying on either side of a line from the southwest corner to Centre de Flacq. Rainfall varies from under 40 inches on the middle region of the west

coast to over 175 inches in the central highlands. Most of the present potato production takes place in the northern plain and the western areas.

In Table VII the monthly rainfall figures are given for four stations ; two, Richelieu and Pamplemousses, are representative for the two main potato areas ; Plaisance represents what is at present a minor potato area on the humid south east side of the island ; Curepipe represents the super-humid zone which is not an important potato growing area but gives interesting comparative climatic information.

Table VIII. *Seasonal rainfall in inches.*

	RICHELIEU	PAMPLEMOUSSES	PLAISANCE	CUREPIPE
January	4.75	7.75	7.46	14.40
February	5.58	7.97	8.35	16.44
March	6.56	9.10	14.14	18.63
April	4.38	5.48	9.11	15.89
May	1.49	4.10	6.80	8.45
June	1.15	2.85	4.92	6.92
July	1.09	2.45	5.34	9.25
August	0.52	2.49	3.05	8.58
September	0.57	1.57	2.48	6.32
October	0.73	1.51	1.86	5.45
November	1.78	2.05	2.97	5.25
December	4.07	4.63	6.14	11.08
Annual means	32.67	51.95	72.62	126.65

Temperature and humidity are set out on a monthly basis for the important potato areas, in Table VIII below. Curepipe normal temperatures are also included for comparison.

Table VIII. *Temperature means in Farenheit and relative humidity*

MONTH	RICHELIEU				PAMPLEMOUSSES				CUREPIPE
	MAX.	MIN.	NOR.	REL. H.	MAX.	MIN.	NOR.	REL. H.	NOR.
January	85.8	76.3	79.6	66.5	85.6	72.7	78.6	78.8	71.4
February	85.8	76.1	79.5	64.9	84.9	73.0	78.4	81.4	72.5
March	84.9	75.7	79.0	69.3	54.0	72.1	77.5	82.3	71.8
April	83.7	72.5	77.5	68.1	81.7	70.0	75.4	81.5	70.0
May	81.7	69.4	74.9	66.0	78.6	66.4	72.0	80.1	66.6
June	77.9	66.7	71.8	64.7	76.8	62.6	68.9	78.0	63.0
July	76.8	65.5	70.6	64.4	74.7	61.7	67.6	76.9	61.9
August	76.3	65.5	70.6	64.0	75.0	61.7	67.6	75.6	61.2
September	78-1	66.0	71.5	59.5	77.2	62.6	69.6	73.5	61.7
October	80.4	69.3	74.3	67.2	80.2	64.4	71.8	72.3	64.0
November	82.8	69.8	75.7	59.6	84.0	67.3	74.7	72.1	67.1
December	84.7	72.9	78.3	65.6	85.5	70.9	77.5	74.9	70.2
Means ..	81.7	70.2	75.3	64.1	80.6	67.1	73.4	77.3	66.8

The above tables give in summary an idea of the climate of the island, particularly the main potato areas. There are a number of micro-climates produced by the relief of the country.

Cultivation

Planting starts towards the end of the summer rains in March and continues until October. As already mentioned there has been a tendency for later planting in recent years so that in 1959 sizeable areas have been planted in November. There is stoppage of all planting in December, January and February during the period of the summer rains which give conditions of high humidity and temperature. Different districts have different planting seasons and these are illustrated in Table V. The crop as already stated matures in 75 to 90 days and is marketed without appreciable storage.

There are two methods of cultivation. Potatoes can be grown in the interrows of virgin cane plantations ; such crops are usually produced by the estate workers and other growers renting land. Secondly, the crop is grown by small farmers, as a pure stand. It is not possible to give an accurate figure for the crops produced in the two categories but it is probably about half and half. It appears that a quite considerable part of the expansion in acreage since 1955 has been accounted for by increasing interrow cultivation on the sugar estates. There has been no general expansion in acreage under potatoes since the war, merely a decline in the middle 1950s which now has been made good again.

In the cultivation of the crop in interrows usually one but sometimes two lines are planted between each pair of rows of plant cane. Good yields can be obtained by this method, 4 or more tons per acre being possible with skilled cultivation. The effect on the cane crop is generally beneficial. It is by this method that expansion of the crop is possible. Other crops of course compete for this area. At present interrow cultivation is irregular and depends on such things as seed being available at the right time. In such circumstances, instead of potatoes, other crops like tomatoes or groundnuts may be planted or none at all. In the second method of pure stand cultivation by the small farmers, close planting on beds is the rule, the density of planting being as close as 12" x 15", sometimes 12" x 12", generally but not always too close for high yields.

Seed supplies

It is estimated that 600 tons or more of seed potatoes are required to satisfy the local demand. The larger part of this quantity is supplied by imports of seed from abroad. Seed has been coming largely from South Africa and has been mainly of the variety *King George* although small quantities of other varieties, such as *Kennebec* and *Majestic*, have been coming in from that source. The price of the seed has been about £ 48 per metric ton. King George is a variety which is now "going out" and supplies of seed are becoming unreliable. The normal trade requirement has been about 500 tons of seed, nearly all of this King George variety. Last year only 300 tons of seed were available from South Africa and the balance was made good by imports of *Delaware* seed from Western Australia and by the use for seed of ordinary table potatoes.

No one suitable successor to King George has yet been found although this should not prove too difficult. Already good results have been obtained from Australian varieties, such as *Delaware* and *Factor* but these have not been sufficiently extensively tried to warrant a dogmatic prediction about their suitability. Promising results have also been obtained from small trials of Kenya varieties and it is likely that a substantial quantity of the blight resistant C53 will be imported from that source in 1960. The price of the seed compares favourably with South African at £ 45 per ton. Australian seed is generally much dearer at, for example, £ 65 per ton for Delaware seed.

As already indicated some of the growers falsely economise on seed using ordinary imported table potatoes. Some once-grown seed is also used. Only an infinitesimal quantity is at present put in cold store over the difficult period from December to March but such storage offers great possibilities.

Manuring

Generally speaking adequate dressings of farmyard manure are applied to the potato crop, and sulphate of ammonia is also commonly used. There is much room for improvement in manuring the crop mainly in achieving better nutrient balance.

Irrigation

Irrigation is not commonly used for the potato crop except in the Black River District where hand irrigation is widely practised. Irrigation of inter-row planted crops is more common since the cane itself is under irrigation. Where irrigation is practised substantial increases in yield are made possible.

Diseases

Blight is a major problem with the crop as would be expected from a study of Tables VII & VIII in relation to temperature and relative humidity. The potato crop in the major production areas is generally free from severe blight damage which is probably a reflection of the lower relative humidities of these areas. However, the incidence of blight is still an important factor in depressing yields.

Another disease of increasing importance is bacterial wilt. A few centres of production are very seriously affected and it can only be expected that this most serious disease will spread amongst the small farmers' holdings where a series of susceptible crops like tomatoes and other Solanaceae are commonly grown. Ensuring clean seed supplies might be the most effective method of exercising a check on its progress in Mauritius. Any crops grown in cane lines should be sufficiently widely separated in time to keep the land clean and damage would normally only occur in such a crop when heavily infected seed is used.

Virus diseases are present but are not a major factor provided certified seed is used throughout.

Economics of cultivation

Various estimates of the cost of producing a crop of potatoes have been put forward. The Extension Service of the Agricultural Department have published the estimate shown in Table XI. Such costs would be expected to lead to a crop of 8 or more tons per arpent.

Table XI. *Cost of production of potatoes*

	Rs per arpent
Purchase of seed ...	... 525
Labour ...	... 300
Irrigation ...	... 300
Fertilizers ...	... 200
Rental ...	... 100
Control of disease ...	... 75
	1,500

The costings for potato production using mechanised methods on Stations of the Department of Agriculture show a similar cost but in this instance the crops were experimental ones so that the cost of cultivation by tractor and labour was much inflated. However, these figures are given for interest in Table XIII.

Table XII. *Cost of cultivation of potatoes at Richelieu Experiment Station*

	Rs	Rs	Rs	Rs
Tractor Cult	218	301	313	277
Labour Cult. Plant Ha.	401	498	485	461
Fert. & Man.	257	247	247	250
Irrigation	131	121	90	114
Seed	480	480	480	480
Fungicides	50	50	50	50
Totals	1537	1697	1665	1633

Experimental crops have usually shown a potential and often an actual yield of 7-10 tons. If it is taken that a 7 ton crop results from these costs a good per acre profit will result. The potatoes should bring an average price of 40 cents per kilo to the producer which means a gross return of 2,100 rupees, giving a profit margin of 1,200-1,300 rupees per acre. With good cultivation there is the opportunity to do better than this. With interrow crops these profits would apply after compensation for the wider spacing used, i.e. conversion to crop acres.

As has been indicated present average yields for the potato crop are around 4 tons per acre. The gross return from such a crop would be Rs. 1,600 per acre, about equal to the costs of production quoted above. These costs are not really relevant however to such production. The small farmer can make some economies on his labour, manure, irrigation and fertilizer. What the small farmer regards as his real costs of production may therefore be very low and still leave him with a substantial profit out of his gross return per acre. The position is that the potato crop gives a substantial profit to the producer who if he is skilled can count on a profit of 1,200 rupees per acre upwards.

Prices

The retail prices of potatoes in recent years has averaged 80 cents per kilo which is 800 rupees per metric ton. The producer has secured about half this return in three months, and can often take two crops a year.

Proposals for the future

1. Research into all aspects of the potato crop will need to be continued and intensified. Variety trials at present running must be continued, covering all likely varieties available from practical sources of supply like South Africa, Kenya, Australia, Madagascar, and elsewhere.

These trials must continue to assess yield, quality and resistance to disease. But in addition it is important that the seed be available at the right time. For example, it is important that the seed be available in early March both to extend the season of local production and to enable once grown seed to be available for later plantings. Such a regime would offer no storage problem. All possible seed supplies must be examined from this point of view. Fertilizer trials need to be carried out at centres other than Richelieu where they have been mainly confined to date and should be extended to interrow crops where a completely different set-up regarding fertilizers exists. Espacement of the crop especially in interrow cultivation needs further examination and investigations of planting times in the various districts need to be looked into in detail. The problems of local production of at least once grown seed need further work. Precise irrigation trials are required. Continuous trials are required. Continuous trials of disease control methods are also a necessity.

2. Seed supply is a special problem and it would seem possible to produce much of the Mauritian requirement from once grown or twice grown seed. Theoretically with only once grown seed import would require to be 100 tons only ; this could be multiplied up to 600-800 tons to satisfy the present total demand for seed. Such a project would require the setting up of an organisation for potato production in the more suitable areas, i.e. the higher cooler areas. It would probably be necessary to produce the seed on a government station or seed farm. Adequate cold storage facilities for carrying over the seed until planting time will of course be necessary.

3. The great problem in expanding the crop, which is shown above to be a profitable one, is the question of land availability. Expansion must come

from increased interrow cropping in virgin canes. With better marketing and stabilisation of the prices, the demand for intercropping in cane lands will presumably increase. With improved seed supply one of the main factors tending towards irregularity of interrow cropping of canes would be eliminated.

4. Perhaps the most essential requirement for the improvement of the industry is the introduction of a rational system of marketing. Now prices fluctuate violently depending mainly on the import situation. The arrival of a shipment of potatoes may most seriously depress them. Middlemen take a very substantial cut of the total retail price. It would seem that an industry in which so much money is already involved, and which has a greater potential requires an organisation which would take care of the marketing of the local crop, storage of the local crop both for consumption and for seed, and also regulate importations of table potatoes and seed. On this point one must not only consider the industry as it exists to-day but as it could be. Without doubt the great bulk, indeed all of the island's potato requirements, could be met by local production were the industry properly organised and adequate cold storage facilities available.

THE CONTROL OF PLANT DISEASES

by

L. ORIEUX

Plant Pathologist, Department of Agriculture

Quite often when the damage done by diseases is first noticed the crop is too far advanced to benefit from fungicidal treatments. Wilted, rotted or virus infected plants do not recover and should best be uprooted and burned to avoid the spread of the diseases. On valuable plants, pruning of affected parts may be a useful preliminary to treatments.

In seed production, to ensure good quality seed and freedom from seed-borne diseases, and in valuable ornamental plants, for aesthetic reasons, the control of every single disease is attempted. Generally it is only when the normal growth of the plant is threatened or when the flowers or the quality or yield are affected, is treatment warranted. Foliage vegetable crops can seldom be sprayed near maturity owing to the danger of toxicity or tainting.

Resistance when available is the most convenient way of avoiding losses.

Seed treatment for the control of damping-off and seed-borne diseases is cheap and should become standard practice. Soil disinfection though expensive is often to be recommended for seed beds, and hole treatment against nematodes is likely to be profitable for tomatoes and a number of other crops.

Most bacterial and fungal pathogens are amenable to control provided they are not systemic or permeate the plant. Drenches may be applied to protect the roots and aerial parts coated with a spray or dust of fungicide to kill or prevent the germination of bacteria and spores. The numbers, or value of the plants or crops, should determine whether it will be worth while or economic to apply fungicidal treatment.

Among the plant diseases listed, only powdery mildews (those of tomato and chillies are exceptions) are susceptible of being eradicated from diseased foliage. In the other cases uninfected foliage and new growth can sometimes be protected and fungicidal treatments are usually solely preventive. Against rapidly spreading diseases like the blights of potato and tomato, treatments should be a matter of routine in localities where blight is likely to occur. As soon as the plants have reached a few inches, spraying should be started and carried out at weekly to fortnightly intervals, according to rate of development of new foliage, rainfall or overhead irrigation. In dry areas where blight does not occur all the time, a small plot which can be checked daily, planted a week or so ahead of the main plantation, will give an indication as to the timing of the sprays.

Light winter rains though favourable for disease development and growth of foliage will not always result in the fungicide being washed away once the spray has dried. It is important not to postpone treatment unduly because of rain.

Choice of fungicides

Commercial firms are always helpful in the choice of a suitable fungicide for the control of a specific disease, but the final criterion for extensive crops is more effective disease control or supplementary profits with improved treatments at competitive prices. Some products may be restricted in the range of diseases they control or have adverse effects on yields.

Labels for the proper use of fungicides

The manufacturers' directions on the labels should be followed as closely as possible. Using more or less than the prescribed rates may lead to phytotoxicity or chemical damage to the crop, or to the failure of effective disease control.

Although fungicides, except mercurials (and some nematocides) are not generally highly poisonous, all precautions indicated on the labels should be strictly followed. All fungicides purchased should have a manufacturers' label with full instructions on an original packing, or be accompanied at least by a leaflet in case of local packages.

Compatibility

The fungicides recommended, except lime sulphur, are compatible among themselves and with most standard insecticides. Systemic insecticides however are best applied by themselves. Mixed fungicides aimed at a number of diseases on one crop, or combined fungicides and insecticides are often a saving in time and labour. Some patent mixtures or combinations are available on the market.

Sprayers

Knapsack sprayers are the minimum for commercial growers, but the amateur gardener must have at least a hand sprayer or garden syringe. Low volume application with motorised knapsack sprayers may not be quite suitable for the control of diseases like blight of potato or tomato under local conditions.

Further information

Growers who require further information should in the first place consult their District Extension Officers (addresses overleaf) who are always pleased to help and in some cases may be able to arrange demonstrations of the application of disease control treatments.

Addresses of District Extension Officers

Port Louis	Port Louis Central Station (Ext. Service)
Pamplemousses	do
R. du Rempart	Mapou Demonstration Centre
Grand Port	Plaine Magnien Social Welfare Office
Savanne	R/Anguilles Demonstration Centre
Flacq	B/Verdière S/Welfare Centre
Moka	St. Pierre ,,
Black River	Bambou ,,
Plaine Wilhems	Quatre Bornes, Civil Commissioner's Office.

(1) *Dilutions*

The figures given in the schedule below for the rates in grams per litre are the same figures as for lbs per 100 gallons, e.g. 2 gms/litre is equivalent to 2 lbs/100 gallons.

(a) *Sprays*

At high volume spraying, use 100 gallons per arpent on a fully grown potato crop, or 2 gallons per 500 sq ft of seed bed, or stop at the pre-drip stage. At low volume, use at the same rate per area : i.e. use 2 lb of Zineb per arpent when spraying at 20 gallons or less per arpent if the high volume rate is 2 lbs per 100 gallons per arpent.

One level dessert spoonful of organic fungicide weighs about 5 gms, one dessert spoonful of copper oxychloride weighs about 8 gms. Use 20 gms or 4 level dessert spoonfuls of Zineb, 30 to 50 gms or 4 to 6 level dessert spoonfuls of copper oxychloride, 5 gms or 1 level dessert spoonful karathane for a two gallon sprayer — high volume. Put fungicide in a tin and add water to make a thin paste, add wetters or stickers (especially on crops like cabbage, onions, peas, etc., which are difficult to wet) at the rate of ½ teaspoonful, stir and wash into sprayer through strainer.

(b) *Drenches*

Use 10 gms or 2 dessert spoonfuls of captan in a watering can of water for 20 square feet of seed bed (5 watering cans for a seed bed 30 x 3 feet). Use ¼ litre vapam in a watering can of water for 20 square feet and apply a water seal, by further watering at the rate of 2 watering cans of fresh water per 20 square feet, sow after 2 weeks, aerate by cultivating some days before sowing, for vapam.

SCHEDULE OF FUNGICIDE TREATMENTS

Plant	Disease	Recommendations
Atte (custard apple)	Mummification of fruit	Captan 3 gm./litre
Beans	Halo blight Anthracnose, leaf & pod spots	Copper oxychloride 3 gm /litre or Zineb 2 gm./litre
Chillies and peppers, egg plants	Powdery mildew, defoliation, leaf spots	Karathane ½ gm./litre or Phaltan 2 gm./litre or Lime Sulphur 25 c.c./litre
Cabbages, cauliflowers, petsai, etc.	Downy mildew (seedling) White rust Black rot (leaf scorch)	Copper oxychloride 3 gm./litre or Zineb 2 gm./litre Use certified or hot water treated seeds (50°C. for 30 minutes).
Cucumber, pumpkins, patisson	Powdery mildew Leaf spots	Karathane ½ gm./litre or Phaltan 2 gm./litre
Citrus, (lemons, oranges, etc.)	Bacterial canker, leaf and fruit spots	Copper oxychloride 3 gm./litre
Carrots	Blights	Copper oxychloride 3 gm./litre or Zineb 2 gm./litre
Egg plant	Leaf spots —defoliation	Zineb 2 gm./litre
Geranium	Rust	Captan 3 gm./litre
Mango	Anthracnose, powdery mildew, leaf spots and inflorescence blights	Captan 3 gm./litre or Phaltan 2 gm./litre
Onions, garlic, leeks	Purple blotch and white tips of leaves	Zineb 2 gm./litre

SCHEDULE OF FUNGICIDE TREATMENTS— *Contd.*

Plant	Disease	Recommendations
Peas, sweet peas	Ascochyta leaf spot	Copper oxychloride 3 gm./litre or Phaltan 2 gm./litre Use certified seeds
	Powdery mildew	Karathane ½ gm./litre or Phaltan 2 gm./litre
Potatoes	Blights	Zineb 2 gm./litre or Maneb 2 gm./litre or Copper oxychloride 5 gm./litre or Copper oxides 5 gm./litre
	Seed dip	Aretan 5 gm./litre
Rose	Black spot (defoliation) Powdery mildew	Captan 3 gm./litre or Phaltan 2 gm./litre
Strawberry	Fruit rot (Botrytis grey mould) Leaf spot and scorch	Dusting flowers of sulphur Captan 3 gm./litre or Zineb 2 gm./litre
Tomato	Blights Stemphylium (grey leaf spot) Powdery mildew Leaf mould	Zineb 2 gm./litre or Maneb 2 gm./litre or Copper oxychloride 3 gm./litre or Copper oxides 3 gm./litre or Phaltan 2 gm./litre
Various vegetables and ornamentals	Damping-off of seedlings Seed borne-diseases	Seed dressings TMTD (Thiram) 1-2gm/1 lb seeds Organo mercury 1-2gm./1 lb or Seed bed drench Zineb 1 gm./litre or Seedlings spray Zineb 1 gm./litre

SCHEDULE OF FUNGICIDE TREATMENTS— *Contd.*

Plant	Disease	Recommendations
Various vegetables and ornamentals	Nematodes, root knot, etc.	Seed bed: drench Vapam ¼ litre/watering can
		Row & hole. Inject 4 c.c. E.D.B. 6" deep, 9" apart
	Root rots—Phytophthora, etc.	Drench—Captan 2 gm./litre or Zineb 1 gm./litre
	Collar rot, etc., Sclerotium, Sclerotinia	Drench pentachloronitrobenzene (PCNB) 20%, 1 gm./litre
	Collar rot, etc., Rhizoctonia	Dust PCNB 20%
	Bacterial rot ,, wilt	No control. Uproot
	Blights, leaf spots, rusts	Copper oxychloride 3 gm./litre or Zineb 2 gm./litre or Phaltan 2 gm./litre or Maneb 2 gm./litre or Captan 3 gm./litre
	Powdery mildew	Karathane ½ gm./litre or Phaltan 2 gm./litre
	Foliar and stem nematodes	Chlorotion 2 gm./litre
	Virus—mosaic, etc.	Uproot

LE MOYEN DE LUTTER AVEC SUCCÈS CONTRE LES PRINCIPALES MALADIES DES PETITES CULTURES A MAURICE

L. ORIEUX

Pathologiste au Département d'Agriculture.

Pour lutter avec succès contre les maladies des plantes il doit tout d'abord être bien établi que les traitements sont essentiellement préventifs. Ils ont pour but de protéger les parties susceptibles de la plante contre les innombrables germes de champignons qui flottent dans l'air, les bactéries et les nématodes, qui sont dispersés par la pluie, et qui séjournent dans le sol.

La pulvérisation des plantations de pomme de terre contre la maladie des tâches foliaires ou mildiou, 'late blight' ou 'pahla', est une pratique bien établie à Maurice. Les pulvérisateurs sont généralement des appareils à dos et les jets sont dirigés sur les faces supérieures et inférieures des feuilles. Les pulvérisations commencent dès que les plants ont atteint six pouces de haut environ, et sont répétées à intervalle d'une semaine afin de protéger les nouvelles pousses et entretenir la couverture des parties déjà traitées. De même, le trempage des pommes de terre de semence dans un bain de fongicide avant la plantation, protège les germes contre certaines maladies séjournant dans le sol ou portées sur la semence.

La pomme d'amour et la tomate, sujettes au même 'blight' que la pomme de terre, sont aussi traitées, notamment dans les régions humides. Le 'blight' est une maladie qui, comme l'indique son nom anglais, s'étend rapidement comme un feu de brousse. Il existe dans presque tous les pays où la pomme de terre est cultivée et a été la cause vers le milieu du XIX^{e} siècle d'une grande famine qui reduisit d'un cinquième la population de l'Irlande La maladie peut donc être transmise à une plantation se pomme de terre par des plants de pomme d'amour infectés. Dans certains pays où la tomate n'est cultivée qu'en serre, le 'blight' de la pomme de terre ne commence qu'à partir des tubercules de semence infectés et dans des conditions d'humidité et de température qui ne se présentent qu'assez tard dans la saison, de sorte qu'une ou deux pulvérisations peuvent suffire jusqu'à la récolte. A Maurice, où les pommes d'amour sont plantées toute l'année, la maladie peut sévir en toute saison lorsque les conditions climatiques sont favorables et être transmise aux plantations de pomme de terre. Aussi, est-il recommandé, pour la pomme de terre, dont le coût de la semence, la préparation du champ et les fertilisants représentent un investissement considérable, de ne pas négliger les pulvérisations de fongicides car, si le 'blight' apparaissait tôt dans une plantation non protégée, tout espoir de rendements profitables serait perdu.

La pomme de terre est aussi sujette à certaines maladies à virus dont la plupart sont de distribution mondiale. Certaines comme l'enroulement des feuilles peuvent causer des pertes considérables, qui vont en augmentant en présence de l'insecte vecteur. Ceci est la raison pour laquelle il n'est pas recommandé de prélever des semences sur les plantations commerciales, ou d'employer comme semences les pommes de terre importées pour la consommation. Dans les grands pays producteurs de pomme de terre des orgasinations ont été établies afin d'assurer la production de semences contrôlées dans les régions où les vecteurs sont absents et où d'autres conditions favorisant le développement des maladies sont au minimum. Par des traitements appropriés, par l'arrachage ou 'rogueing' des plants malades et au moyen d'inspections aux champs, les Services Agricoles sont en mesure de certifier que l'incidence de certaines maladies ne depassera pas les limites imposées. Il est donc recommandé de ne planter que des semences certifiées de pomme de terre si l'on veut escompter de bons rendements. Les pommes de terre de table que nous importons de diverses pays peuvent provenir de champs plantés de tubercules de 1ère et 2me générations à partir de semences certifiées, sans que les précautions spéciales appropriées aient été prises pour empêcher la contamination des tubercules. Si l'on produisait des semences de pomme de terre localement, des précautions telles que la pulvérisation d'insecticides et le 'rogueing' des plants malades, seraient prises afin de réduire au minimum l'incidence de la maladie et sa transmission d'un plant à un autre.

Comme pour d'autres maladies de la pomme de terre la résistance de certaines variétés constitue un moyen de lutte efficace. C'est ainsi que la *King George* est très estimée localement pour sa résistance relative au flétrissement bactérien, et que la *Kennebec* l'est pour sa résistance au mildiou.

Jusqu'ici nous avons été épargnés d'autres maladies sérieuses de la pomme de terre comme la galle verruqueuse, la bactériose ou 'ring rot', le nématode doré, et certaines viroses. Nous sommes protégés contre l'introduction de ces maladies par la réglementation des importations de pomme de terre. L'importation de pommes de terre de certains pays contaminés est prohibée et la garantie appuyée de certificats phytosanitaires, est exigée que les pommes de terre importées proviennent de régions exemptes de ces maladies.

Beaucoup de maladies, comme le 'mildiou', sont favorisées par la combinaison des facteurs chaleur et humidité de l'atmosphère. Par contre certaines maladies moins spectaculaires, comme l'alternariose ou 'early blight' de la pomme de terre et de la pomme d'amour, le stemphylium ou tâches grises de la pomme d'amour, le blanc de la pomme d'amour et du piment, peuvent occasionner des pertes considérables par temps relativement sec. Ces maladies ne sont pas facilement reconnaissables; elles causent un jaunissement et un flétrissement des feuilles et réduisent considérablement la durée et la production des cultures. Des symptômes ana-

logues sur la pomme de terre ou sur la pomme d'amour, sont aussi causés par un petit acarien, si petit que l'on ne peut le distinguer qu'à l'aide d'une très forte loupe. Celui-ci cependant est du ressort de l'entomologiste qui possède un arsenal plus considérable que le phytopathologiste pour la lutte contre les ennemis des cultures. Toutefois il a été rapporté que le zineb, fongicide recommandé actuellement contre le 'mildiou' et l'altenariose de la pomme de terre, et le mildiou et le stemphylium de la pomme d'amour, serait efficace contre cet acarien. Le karathane recommandé contre les blancs de la pomme d'amour et du piment est aussi un acaricide reconnu.

Un jaunissement et un aspect débile des plants de pomme d'amour peuvent aussi être causés par le nématode des galles des racines qu'on peut facilement reconnaître aux nodosités sur le système radiculaire si on arrache le plant. Contre cette maladie le traitement par injection des poquets des champs infectés avant la plantation au moyen d'un nématicide est recommandé.

La lutte contre les maladies n'est rentable que lorsque la culture est d'un bon rapport, ainsi les planteurs de pomme d'amour ne sont pas enclins à traiter leurs champs lorsque les prix sont bas. Par ailleurs, le jardinier amateur voudrait d'un remède pour chacune des maladies de son jardin. Certaines maladies sont très spectaculaires, mais le plus souvent quand on en voit les symptômes il est déjà trop tard pour y porter remède. Les blancs du pâtisson ou du petit pois et de bien d'autres plantes seraient des exceptions et leurs dégâts pourraient être arrêtés par l'application de produits tels que le karathane, ou le phaltan, ou encore le souffre ou les bouillies sulfocalciques, quoique pas toujours recommandables, mais seuls disponibles jusqu'à tout récemment.

Contre certaines maladies importantes des cultures, les fongicides à base de cuivre, dont la bouillie bordelaise, ont été pendant longtemps les seuls efficaces ou économiques. Le pérénox, un oxide de cuivre, le soltosan et d'autres oxychlorures de cuivre, sont d'usage courant à Maurice. Depuis quelque temps des fongicides de synthèse, dont le zineb et le maneb, plus efficaces que les produits cupriques contre un grand nombre de maladies, sont en voie de déplacer ces derniers dont on a pu constater certains effets nocifs sur les plantes. Le phaltan, un produit plus récent, est efficace contre les blancs aussi bien que les autres maladies, et ce produit ou quelque chose d'analogue serait la panacée rêvée des cultivateurs.

Les nouveaux fongicides s'emploient à des taux beaucoup plus faibles que les bouillies cupriques, le zineb par exemple à 1½ - 2 livres à l'arpent au lieu de 5 livres d'oxychlorure pour la pomme de terre, de sorte que malgré son prix relativement plus élevé, le coût d'une application est nettement inférieur.

En s'inspirant toujours du principe des traitements préventifs et

aussi du point de vue économique, le traitement des semences de toute culture au moyen d'un produit fongicide est, comme le trempage des pommes de terre de semence, un moyen peu coûteux de protéger les germes et les jeunes plantes contre certaines maladies portées sur la semence, contre la fonte des semis, et contre d'autres pathogènes séjournant dans le sol. Une telle pratique jointe à une rotation rationnelle des cultures, peut éviter bien des échecs. Dans d'autres cas le traitement des semences à l'eau chaude à environ 50°C pendant 20 minutes est efficace. Cependant dans bien d'autres cas, il n'existe pas de traitement efficace et le moyen d'éviter la maladie consiste à se procurer des semences saines, produites et certifiées, comme dans le cas des semences de pomme de terre. Dans le cas des semis, ceux-ci avant d'être ensemencés peuvent être traités avec un nématicide par injection et un fongicide par arrosage ou en mélange avec les fertilisants. Le vapam un nouveau nématicide est efficace contre les champignons, les bactéries et les mauvaises herbes et s'emploie par simple arrosage.

Au champ le traitement des lignes ou poquets au moyen de nématicides, ou du feuillage par des pulvérisations de fongicides, est plus coûteux, et n'est justifié que dans le cas de maladies assez sérieuses et pour des cultures de grande valeur. Pour les légumes feuilles, comme les salades, les brèdes, le traitement des maladies au champ, passé un certain stade de développement est inefficace et pourrait être dangereux pour le consommateur.

Les variétés de légumes couramment cultivées et surtout celles qui ont été acclimatées et dont on peut se procurer les semences au Département d'Agriculture, sont assez résistantes aux maladies. Le Département introduit constamment des variétés nouvelles dans le but d'étudier leur comportement sous nos conditions. Les progrès accomplis dans la production de variétés résistantes et améliorées, et surtout ceux de date récente pour les conditions tropicales, nous donne le ferme espoir qu'on pourrait un jour réaliser, pour presque toutes les cultures, cette résistance naturelle qui serait le moyen le moins onéreux de lutter avec succès contre les maladies.

Pour les plantes ornementales il existe aussi dans certains cas des variétés résistantes aux rouilles ou aux flétrissements, mais le jardinier amateur cherchera toujours à combattre sur ses rosiers préférés, les tâches noires ou le mildiou, contre lesquels le phaltan est très efficace. Contre certaines maladies des racines des arrosages de fongicides, suivis d'un binage, peuvent être efficaces.

Les fongicides sont assez spécifiques et le choix d'un produit, pour une maladie particulière s'attaquant à une culture particulière, est assez difficile. Par exemple, il est rapporté que le captan est très efficace contre l'anthracnose du manguier qui cause la coulure des fruits, tandis que d'autres produits sont pratiquement sans effets.

Les modes d'emploi accompagnant les fongicides devraient préciser

les maladies susceptibles d'être contrôlées, les précautions à prendre à l'usage, et les taux d'application recommandés lesquels devraient être strictement suivis. L'emploi de doses approximatives au lieu de celles recommandées pourraient, si elles étaient trop fortes, causer des dommages importants aux cultures, ou manquer d'efficacité dans le cas où elles seraient trop faibles.

Le personnel du Service de Vulgarisation du Département d'Agriculture est toujours heureux d'aider et de guider les planteurs dans la lutte contre les maladies s'attaquant aux petites cultures.

Les ouvrages illustrés sur les moyens de défense des cultures sont toujours utiles pour aider à reconnaître certaines maladies, mais les indications qu'ils donnent quant aux traitements à appliquer sont parfois désuètes, vu la rapidité des progrès de la science, notamment en ce qui concerne la découverte de nouveaux fongicides. Un guide pour la lutte contre les maladies les plus courantes des cultures à Maurice a été préparé à l'intention du cultivateur et du jardinier amateur et peut être obtenu sur demande au Service de Vulgarisation du Département d'Agriculture.

COMITÉ DE COLLABORATION AGRICOLE MAURICE-RÉUNION-MADAGASCAR

CONFÉRENCE 1960 (Xème)

Le mercredi 12 Octobre 1960 à 11 h. s'est tenu à la Direction des Services Agricoles de la *Réunion*, à *Saint-Denis*, la 10ème réunion annuelle du Comité de Collaboration Agricole MAURICE-RÉUNION-MADAGASCAR sous la présidence de M. A. ENOCH, Ingénieur-en-Chef, Directeur des Services Agricoles à la *Réunion*.

Étaient présents, au titre de membres du Comité :

Délégation de la Réunion

MM. A. ENOCH, Ingénieur en Chef, Directeur des Services Agricoles, Président du Comité.

Roger PAYET, Président de la Chambre d'Agriculture.

E. HUGOT, Directeur Général de la Société des Sucreries de Bourbon représentant le Syndicat des Fabricants de Sucre.

A. BEGUE, Directeur du Centre Technique de la Canne et du Sucre.

Délégation de Maurice

MM. A. NORTH-COOMBES, Directeur du Département de l'Agriculture, Vice-Président du Comité

Dr. P. O. WIEHE, Directeur de l'Institut de Recherches Su-Sucrières.

René NOEL, Président de la Société de Technologie Agricole et Sucrière.

Claude NOEL, Président du Comité des Directeurs de Propriétés Sucrières

E. PIAT, Premier Vice-Président de la Chambre d'Agriculture.

Maurice PATURAU, Délégué du Comité chargé d'organiser le congrès sucrier international de 1962.

Délégation de Madagascar

MM. TICHIT, Ingénieur en Chef, Chef des Services Agricoles p.i., Vice-Président du Comité.

Dr. R. PAULIAN, Directeur-Adjoint de l'O.R.S.T.O.M. à Madagascar.

De BLIE, Directeur de la Société Sucrière de la Sakava, Représentant de l'Industrie Sucrière.

Assistaient également à titre d'observateurs : MM. Donald D'EMMEREZ DE CHARMOY, Clérensac BOYER DE LA GIRODAY.

Allocution du Président brièvement résumé : " institué il y a une dizaine d'années le Comité de Collaboration se trouve à nouveau réuni. La nombreuse assistance témoigne de son succès et notre Comité est plus vivant que jamais. Je rappelle qu'il a été créé surtout pour les professionnels ; grâce à lui des contacts organisés ont lieu et il est souhaitable que ces contacts se produisent le plus souvent possible afin que chacun puisse se rendre compte et profiter des progrès constatés chez ses voisins.

M. ENOCH signale qu'il a été heureux d'accueillir des délégués nouveaux : MM. TICHIT, Claude NOEL, PIAT, PATURAU.

Puis il expose les :

Travaux du Comité effectués au cours de l'année 1959-1960

Nous avons reçu six étudiants du Collège d'Agriculture de Maurice accompagnés de leur Directeur et d'un professeur tandis que nos élèves de l'Ecole d'Agriculture de Saint-Joseph, accompagnés d'un professeur, ont également fait un séjour à Maurice.

M. BAUDIN, Phythopathologiste à Madagascar, est venu en mission d'informations étudier les maladies de la canne.

M. CHAUCHAT, Ingénieur des Travaux Agricoles chargé de l'Arboriculture a passé une huitaine de jours à Maurice, tandis que son homologue à Maurice M JULIEN est venu également une semaine à la Réunion. Ils ont pu échanger des conseils, des semences et des boutures de diverses espèces.

M. ANTOINE, Phytopathologiste de l'Institut de Recherches Sucrières à Maurice, est venu en une autre mission prospecter les champs de cannes en liaison avec M. d'EMMEREZ. En fin de sa mission, il a fait un exposé très écouté sur la gommose.

M. TONNIER, Généticien du vanillier à Madagascar, à son départ en congé en Métropole, a profité d'une escale dans l'Ile pour prendre connaissance de nos cultures de vanillier et n'a pas manqué de nous donner de très utiles renseignements sur les moyens de lutter contre la fusariose et une culture plus rationnelle du vanillier.

M. CARESCHE, en septembre, pendant une semaine, a eu le temps de revoir la situation de l'Ile en ce qui concerne les borers, et au terme de sa mission de nous faire un exposé trés intéressant, comportant notamment les mesures envisagées pour lutter contre ces insectes.

A Maurice, du 4 au 12 juillet, s'est tenu le congrès sucrier auquel assistaient 17 délégués réunionnais, dont la plupart étaient des professionnels. En mon nom personnel, ainsi qu'au nom des professionnels réunion-

nais, je me dois encore de remercier les organisateurs de ce congrès qui a été indiscutablement un succès.

MM. BARBUT et DAVID, respectivement Ingénieurs Généraux des Services Agricoles et du Génie Rural, en France, venus en mission d'Inspection à la Réunion ont pu prolonger leur itinéraire à Maurice, où ont été organisées des visites intéressantes pour ces hauts fonctionnaires.

De Maurice, nous avons reçu un certain nombre d'hyperparasites des insectes de la canne. Enfin, de l'O.R.S.T O.M. de Madagascar nous venons de recevoir la carte pédologique de la Réunion, en 1 100.000ème, établie à la suite de la prospection de M RIQUIER. Nous attendons le commentaire de cette carte, document assez important puisqu'il groupe 700 à 800 résultats d'analyses.

M. ENOCH est heureux de faire remarquer la gamme importante des activités du Comité. Il remercie les participants de s'être déplacés et d'être venus assister aux visites, tournées et travaux du Comité. « Ce qu'ils ont peut-être perdu en temps » dit-il, « ils l'ont retrouvé en sympathie, agrément, conseils et renseignements utiles ». Il remercie aussi tous ceux qui ont reçu les délégations, facilité leur voyage et agrémenté leur séjour.

Nouveau programme de travail

M. NORTH-COOMBES met en avant le sujet de la maladie de Fidji qui reste une menace redoutable pour les Mascareignes.

M. WIEHE devant l'appréhension de voir reparaître des cannes de bouche sur les marchés de Madagascar estime que si on doit retourner à cette ancienne pratique, il serait utile d'attendre un délai de quelques mois afin que les résultats des essais de résistance contre la maladie de Fidji soient connus.

M. TICHIT convient qu'il faudrait attendre quelques mois avant de laisser une trop grande facilité aux échanges commerciaux.

M. WIEHE demande l'autorisation pour que M. ANTOINE puisse visiter Madagascar en deux fois et propose que le sous-comité des maladies de la canne se réunisse à la Réunion à une date à fixer ultérieurement en 1961, estimant que les résultats du premier essai de résistance à la maladie de Fidji seront connus d'ici environ un mois.

M. WIEHE désirerait que M. DUPONT DE SAINT-ANTOINE vienne à la Réunion pendant une dizaine de jours afin de visiter quelques usines, certains arrangements ayant déjà pu être pris avec quelques usiniers.

Au sujet des borers, M. DUFOURNET, transmet le souhait de M. CARESCHE de voir les trois îles se réunir pour prospecter les faunes naturelles de parasites et en importer d'autres du Sud Asiatique. M. BRENIERE spécialement chargé des travaux sur les borers à Madagascar pourrait venir ici lui-même faire le point au courant de 1961.

Il propose aussi que M. MONTAGNAC prenne des contacts avec les spécialistes d'arboriculture de la Réunion. M. WIEHE, revenant au sujet des parasites des borers, rappelle que Maurice a importé plusieurs milliers de diverses espèces des Indes (11 espèces voir annexe 1), mais qu'il serait effectivement très intéressant d'en emporter de l'Indonésie qui serait le pays le plus propice : cependant il est difficile d'avoir des contacts avec l'Indonésie.

M. ENOCH signale que la Réunion ne sera pas en mesure de faire des élevages de mouches importants avant 2-3 ans, c'est-à dire avant que ne soit installé le laboratoire d'Entomologie.

M. NORTH-COOMBES demande aux délégués de la Réunion et de Madagascar s'ils pourraient leur procurer quelques spécimens d'insectes parasites des fruits, par exemple le longicorne du manguier, des larves et des adultes des mouches des fruits.

Il signale ensuite qu'il a été très alarmé par la présence possible du ringrot sur les pommes de terre de Madagascar. Heureusement, M. PLENET Contrôleur de la Protection des Végétaux à la Réunion a pu assurer au terme de ses prospections, que cette maladie signalée à Madagascar, n'a pas été relevée.

Puis il aborde diverses autres matières agricoles auxquelles s'intéressent plus spécialement les responsables de l'administration agricole de l'Ile Maurice.

Développement des plantes fourragères : il ressort que la Réunion et Madagascar ont des espèces fourragères utiles qui pourraient venir à Maurice ; cependant l'introduction de graminées dans les deux îles, vu l'existence de la maladie de Fidji dans la 2ème et la gommose spéciale à la Réunion dans l'autre, sans compter des dangers tels que l'introduction de la mosaïque et autres maladies, ne peut être envisagée qu'en très petites quantités après quarantaine très stricte.

Nouvelles identifications d'insectes

A Maurice 110 espèces d'insectes nouvelles ont été identifiées, en particulier, deux aphis qui ont fait un mal considérable sur les jeunes semis de thé qu'il a été nécessaire d'effectuer après les dégâts du cyclone.

A propos de thé, M. North-Coombes fait l'éloge du thé réunionnais qui, dans des conditions de terrain difficiles a magnifiquement démarré.

Enseignement agricole

M. NORTH-COOMBES déclare que "depuis quelques mois a pris corps un projet de réorganisation de l'enseignement agricole. Dorénavant le Collège d'Agriculture de Maurice aura une première année d'enseignement de base et deux années de spécialisation soit en agriculture, soit en

technologie sucrière. Pour ce qui est de la formation générale, Maurice n'ayant pas la même gamme de cultures que la Réunion, il serait très utile que ses étudiants puissent se former pendant un ou deux mois, auprès des spécialistes de la Réunion, ceci aux frais de l'Ile Maurice. Nous avons demandé à M. PERRIN, Directeur de l'Ecole d'Agriculture de Saint-Joseph, d'avoir l'obligeance de nous transmettre un programme détaillé de son enseignement ».

M. DUFOURNET annonce qu'en matière de cultures fourragères de nombreuses espèces sont actuellement à l'essai, tant à la station du Lac Alaotra qu'en d'autres points.

Je propose à M. NORTH-COOMBES que Maurice envoie son « agrologiste » auprès de M. BOSSER spécialiste des graminées.

M. CLAUDE NOEL propose la formation d'un comité mixte entre les trois îles pour lutter contre les parasites à la fois maladies et insectes.

M. DUFOURNET fait remarquer que des sous-comités inter-îles pourraient aussi être créés pour d'autres disciplines agricoles ou technologiques (p. ex. problèmes de clarification en usine).

M ENOCH accepte ce point de vue, pensant que de tels sous-comités pourraient se réunir une fois par an.

Lorsque M. DUFOURNET annonce que M. MONTAGNAC, spécialiste arboricole doit venir à la Réunion, M. Claude NOEL suggère de faire venir un Mauricien à sa rencontre. M. NORTH-COOMBES propose qu'il pourrait prendre son collègue CHAUCHAT en passant et venir à Maurice.

M. PAULIAN, au sujet des sous-comités spécialisés, émet l'avis que si ceux-ci doivent se réunir en réunion de confrontation le Comité aurait beaucoup à gagner à savoir ce qui se passe dans les pays avec lesquels les trois pays du Comité ont des liaisons aériennes et maritimes régulières et donc des risques d'introduction de parasites de ces pays : cas de Maurice surtout qui a des liaisons fréquentes et régulières avec l'Union Sud-Africaine, l'Est-Afrique, l'Australie, notamment.

Le Comité devrait annoncer les dates des ses réunions suffisamment à l'avance et avec assez de publicité de telle sorte que ces pays puissent envoyer des observateurs s'ils le désirent.

M. ENOCH demande s'il ne serait pas possible d'envoyer un de ses collaborateurs en mission à l'île Rodrigues pour y voir les travaux de lutte contre l'érosion M. NORTH-COOMBES repond que cela est possible quoique cela pose un problème de transport car pour faire la liaison Maurice-Rodrigues il n'y a qu'un petit navire ; il faut prévenir avec trois à quatre mois de préavis pour obtenir une place. Deux périodes sont plus favorables soit en mai soit en octobre-novembre.

Puis M. HUGOT entretient l'assistance des problèmes de chargement, de stockage et de réception des sucres. « La Chambre de Commerce de la Réunion s'est décidée pour le chargement en vrac. Un silo a été étudié par l'Ingénieur Conseil de la Chambre de Commerce qui est l'Ingénieur en Chef des Ponts et Chaussées. Sur 13 ou 14 offres celle de Fives-Lille a été retenue. Tout est réglé au point de vue technique. On doit modifier les quais en fonction de l'appareillage de mise à bord. L'Etat a accepté le principe mais il n'a pas encore enteriné le dossier et nous n'avons pas encore l'avis du financement par l'Etat, nous craignons que cela ne se produise que début Mars 1961. Le chargement des bateaux en vrac serait alors pour la fin de la campagne 1963.

Les ports réceptionnaires des sucres en Métropole sont Marseille, Bordeaux, Nantes, le Havre et Rouen. Le Havre et Rouen demandent des délais pour s'équiper pour le vrac. Tous les sucres ne partiront pas en vrac, par exemple ceux à destination de Bordeaux à qui nous n'avons pas demandé d'être organisé, également ceux à destination de Casablanca. A Marseille, la Chambre de Commerce a mis à la disposition des Raffineries de St.-Louis l'ancien poste de réception des arachides Cette disposition n'est pas très intéressante. Quant à Sète, le Président-Directeur Général de la Raffinerie de Sète ne réalisera l'équipement pour le vrac que lorsque nous aurons commencé à la Réunion.

La capacité du silo à la Réunion sera pour commencer de 20.000 T. en forme de demie carapace de tortue ; au total, si l'on appose l'autre moitié, la capacité sera de 40.000 T. Le cœfficient de passage est de 1/8.

Revenant à l'enseignement agricole, M. TICHIT, annonce qu'une nouvelle Ecole d'Agriculture a été créée formant des Ingénieurs des Travaux Agricoles à partir de conducteurs de travaux du niveau du baccalauréat et que celle-ci pourraient recevoir quelques élèves de Maurice.

Abordant le sujet du diagnostic foliaire, M. DUFOURNET demande pour M. WELLI l'autorisation de revenir à Maurice et à la Réunion afin qu'il se mettre au courant des derniers développements. A son avis, il existerait d'assez grandes divergences et il serait nécessaire que les spécialistes fassent le point sur ce sujet d'une importance essentielle. M. WIEHE accepte demandant simplement de préciser l'époque de sa venue, car M. HALAIS est absent de Maurice six mois sur douze.

M. LE PRÉFET fait alors son entrée et M. ENOCH rappelle brièvement la nature des sujets qui ont été traités.

M. LE PRÉFET indique qu'il voulait simplement être présent pour montrer que le représentant du Gouvernement s'intéresse aux problèmes de l'Agriculture et de l'Industrie Sucrière. L'Agriculture poursuit-il est absolument capitale pour les trois îles, puisque sans elle nous ne saurions envisager aucune solution à la croissance de la population. Dans l'Agriculture, particulièrement à Maurice et à la Réunion, le sucre joue un rôle

providentiel et le problème du sucre devient à certains points de vue un problème qui dépasse le cadre des trois îles, et de la Métropole, puisqu'il s'intègre dans le cadre des grands marchés, « Marché commun, etc... » qui amorce de nouveaux courants dans le commerce et de nouvelles liaisons dans la relation des hommes entre eux. Des rencontres comme les vôtres sont d'une extrême importance et dans le monde il est beau de constater qu'en dehors des organismes et des théories politiques qui dégénèrent en tribune, il existe quand même des groupes d'hommes animés d'un même souci de travail en commun. A l'avenir puissent ces contacts se poursuivre qui font que des hommes œuvrent pour d'autres hommes pour le bien de l'humanité toute entière.

M. NORTH-COOMBES au nom de la délégation mauricienne exprime à M. LE PRÉFET sa reconnaissance pour l'intérêt qu'il manifeste à l'égard des travaux du Comité. Il adresse également ses remercîments à M. ENOCH et à ses collaborateurs aux membres du Comité ainsi qu'au Président du Syndicat des Fabricants de Sucre et à toutes les autres personnes ayant pris une part active à l'organisation du Comité. Il invite la Réunion et Madagascar à se réunir à Maurice en Octobre 1961.

M. TICHIT, pour terminer, associe ses remerciements à ceux de M. NORTH-COOMBES, exprimant sa satisfaction d'avoir pu, en quelques jours avoir de nombreuses et intéressantes conversations sur de nombreux sujets techniques.

REVUE DES PUBLICATIONS TECHNIQUES

PROSKOWETZ, F & CHEN J.C.P. (1961) — **Performance of continuous centrifugals in Peru.** *I. S. J.* **63** : 77-78.

Continuous centrifugals have been working in Casa Grande sugar mill since 1955. Four machines of three types from two different makers. Escher Wyss and B.M.A., have been used. The first continuous centrifugal installed was an Escher Wyss horizontal push-type model C — 4/4. Running at 70°C and 900 r.p.m. the output of affined sugar was 6 tons/hr and the power consumption 18 h.p. This centrifugal was promising for affination but unsuitable for a product which had to be bagged, because the output was wet, lumpy and contained many broken crystals.

In 1958 two additional Escher Wyss machines (model C — 4) were installed. These machines have automatic feeding devices and when they were fed with the same quality of massecuites as fed to the other machines the output of affined sugar was 8 tons/hr at 900 r.p.m. Power consumption was 25 h.p.

Again it was found that these centrifugals were suitable for affined sugar but not for sugar which had to be bagged. The position of the wash water nozzles was critical both in controlling the amount of lumps and the colour of the washed sugar.

For C massecuite one vertical spindle continuous B.M.A. machine was used alongside six 45 in. x 24 in., 1,500 r.p.m. and six 42 in. x 24 in., 1,500 r.p.m. batch centrifugals.

The B.M.A. machine had a diameter of 25.6 in., ran at 2,450 r.p.m. and with feed at 45°C could handle from 1.1 to 2.6 tons massecuite/hr, the temperature of the massecuite being rather critical.

The use of steam in the B.M.A. machine raised the sugar purity from 75 without steam to as high as 96 with steam, without influencing the purity of purged molasses. This machine showed much promise on low grade massecuite. For the same purity of molasses it gives better sugar, thus reducing recirculation of impurities. Unless the screen is defective, massecuite cannot get into the molasses. Sugar loss by 'overcharging' is thereby avoided. With the Escher Wyss centrifugals there were no special problems in maintenance but with the B.M.A. machine the principal maintenance item was found to be the screen.

M.R.

DOUWES-DEKKER, K. (1961) — **"Again : Imbibition".** *S. Afr. Sug. J.* **45** : 54-63.

The author stresses the importance of good mixing of imbibition liquid with residual juice in the bagasse so as to obtain the highest extraction figure possible during the process of cane milling.

In order to gauge the efficiency of the imbibition operation, the dilution ratio is made use of. This ratio expresses the actual drop of brix of juice from cane to bagasse as a percentage ratio of a target drop. The arbitrary target for the imbibition process is the reduction of the brix of the juice in cane during the milling operation to 15% of its original value.

For constant milling conditions, there seems to be a close correlation between Dilution Ratio and Mill Extraction. For Natal conditions, for example, a difference of approximately 7 units in dilution ratio corresponds to a difference of one unit in the sucrose extraction percentage.

The system of 'rational imbibition' as practised by Mr. M. Rivière of Réunion seems to speak in favour of Dr. Dowes-Dekker's theory of efficient imbibition with the object of increasing mill extraction.

F.W.

SUTHERLAND, G K. (1960) — **Polysaccharides and the viscosity of mill syrups.** *I.S.J.* **62** : 185-186.

Australian and Fijian syrups show great variations in viscosity. Dextran is found to be present in cane and in juices. It is probable that dextran from the cane passes through the clarification stage where it causes difficulties in clarification and reaches the syrups causing high viscosities.

Certain high viscosity syrups from several mills were selected and the polysaccharide materials from the syrup investigated. Results seem to indicate that the presence of polysaccharides in the syrup has a dispersing effect on certain insoluble materials which are carried over from clarification and contribute to viscosity increase. Delay in the crushing of cane after burning and/or after harvesting appears to be a major factor in the abnormally high production of dextran materials. This in turn affects the boiling properties of the syrups adversely and consequently the quality of the sugar products.

E.C.V.

RAMAIAH, N.A., SNIVASTAVA, R D. & RAO, K.K. (1960)— **Studies on the effect of surfactants on the coagulation of colloids in cane juice.** *Proc. Sug. Tech. Ass. India* 28 : 196-200.

In recent years the use of surface active agents known briefly as surfactants in various operations dealing with particles of characteristic nature of surface, has attracted the attention of various workers.

The present article deals with the study of the effect of a commercial cationic surfactant 'Fixanal G' on the elimination of colloids in the clarification of muddy juice.

Unclarified juice was sampled after liming and sulphitation treatment and heated to 100°C in the laboratory. Subsamples of juice 1,000 c.c

each were then poured into separate flasks in which different quantities of ' fixual G ' solution were added. After thorough shaking, the content of each flask was poured into separate 1,000 c.c. graduated cylinders. The mud volume in each cylinder was measured at different intervals of time. From the results, the rate of settling of the mud was calculated and curves of mud volume per cent v/s time in minutes and final mud volume per cent v/s per cent surfactant were established.

During the experiment, the colour of the supernatant clear juice was also measured by a spectrophotometer. It was interesting to observe that the effect of the surfactant on the removal of colour was profound, appreciable quantity of the colouring colloids having been precipitated.

F. W.

ANON (1961) — **Separan A P 30 as a clarification aid.** *Tech. Rep. 67, Sug. Res. Inst. Mackay.*

During the 1960 crop experiments were carried out at Pleystowe Sugar Factory, Queensland, to assess the advantages of the polyelectrolyte Separan A P 30 in clarification. The factory is equipped with two Back subsiders, and all the tests were made on one of them. The flow rate through the clarifier was varied and measurements made with the help of a 5 inch orifice plate to an accuracy of ± 1 % at rates up to 23,000 g. p. h.

During operation, the normal rate through the clarifier varied from 10,000 to 12,500 g. p. h. but could be increased to about 16,000 g.p.h. without deterioration in the turbidity of the clarified juice. At higher rates, however, juice turbidity increased beyond an acceptable standard.

When separan was added to give a concentration of 2 ppm on juice, flow rate through the subsider could be increased to 22,000 g. p. h. while maintaining juice turbidity at a satisfactory level. At the same time, the mud did not build up in the subsider. In other words, subsider capacity was increased by 35 per cent with the addition of the polyelectrolyte at a cost of Rs. 350 per week for a 100-ton per hour factory.

J. D. de R.

ANON. (1961) **Sludge removal from B. molasses. Factory investigations with commercial separators.** *Tech. Rep 65, Sug. Res. Inst., Mackay.*

Experiments were carried out at Fairymead Sugar Factory, Queensland, to assess advantages of partial de-sludging of B. molasses. Two separators manufactured by Westfalia were used, namely, the SKIG 10006 and the SAMN 15037. Although these two machines achieve about the same efficiency of separation, the SAMN model is to be preferred because it yields a much thicker slugde and can be operated continuously, whereas the SKIG must be dismantled after a few days' work for cleaning.

Furthermore, screening of the incoming feed is unnecessary with the SAMN as the machine has no nozzles like the SKIG but is fitted with a large number of ports 3" x 0.3" which are not likely to be blocked by large particles in the sludge.

The advantages gained by de-sludging B. molasses in the SAMN separator are :—

1. Reduced sugar loss in molasses. The elimination of 5 per cent. of B. molasses in the form of sludge and at 34 true purity causes an increase of about 0.2 per cent. in overall sugar recovery.

2. The load on the low grade pans, crystallizers and centrifugals is reduced by 5 per cent. In other words, the capacity of these items of equipment is increased by 5 per cent. This might be credited as being equivalent to about one-third of the capital cost of the de-sludging equipment.

3. Reduced viscosity and increased workability of C massecuites which thus yield lower purity final molasses. During the tests the net result was an increase of 0.24 per cent. in overall recovery.

4. Reduction in ash content of shipment sugar.

J. D. de R.

BRUIJN J. (1960) — **The presence of thermophylic and mesophylic micro-organisms in sugar and intermediate products.** *S. Afr. Sug. J. 44* : 57-59.

In sugar manufacture there are two main sources of infection ; the cane itself contaminated by micro-organisms from soil and dust which find their way into the juice and the air from which the organisms settle on all products exposed to it. Some of these micro-organisms, for example bacteria, whose optimum activity occurs between 20° and 35°C are called mesophylic. Others thrive best between 50°C and 60°C and are the thermophylic micro-organisms. All non-spore forming organisms as well as yeasts and moulds, although spore-forming, are killed when heated to 100°C.

In order to obtain an impression of the amount of contamination found in sugar and intermediate products a survey was carried out at a number of mills over a period of some months. The factories concerned used four different manufacturing techniques.

It appeared that settling and filtration are more effective than heat to remove micro-organisms. The amount is low in clarified juice ; most of the bacteria settle in the muds. Although most yeasts and moulds are killed by heat raw sugars still contain a large amount on account of recontamination from the air. Thermopyles were only occasionally found and rarely in mill white and refined sugars.

E. C. V.

WOLD, L. R. (1959) — **Space planting of sugar cane.** *Proc. Hawaii Sug. Tech.* : 62 - 68

The author considers that sunlight energy is not utilized at its maximum in an overcrowded population of fast growing, vigorous and high tonnage cane varieties. Profuse stooling and cane lodging occur at about six to eight months, the leaf pattern is completely disrupted and many canes lodge on top of each other resulting in high mortality due to shading.

Comparison is made between the normal cultural method of sugar cane plantations with the 2 plant — 1 skip cultural method which consists in leaving every third line as a blank. On the theory that stooling ability of cane is in excess of the sunlight available a series of seven tests with 92 replicates were conducted at Lihue during the past twelve years. The results obtained showed no significant gain or loss of sugar comparing normal 5 - foot planting of cane with a practice of leaving every third line blank. On economic grounds, however, the 2 plant - 1 skip method showed distinct advantaes which were :— (1) Less seed needed per acre, (2) faster planting, (3) reduced irrigation water first 7 or 8 rounds, (4) increased irrigation performances first 7 or 8 rounds, (5) reduced replanting needed due to more vigorous stooling and less lineal feet of cane line to replant.

Estimated savings were (1) cost of planting per acre, (2) a decrease in irrigation labour cost per acre first 8 rounds, (3) water costs per acre and (4) replanting costs. However, an increase in weed control costs was estimated and was calculated on the basis of one extra close-in spray to the 2 plant - 1 skip method.

Several cultural key points to assure good results with the experimental method were pointed out. Of these mention was made of the way fertilizer application should be carried out and of the procedure to be adopted for the irrigation practices.

Considerably more research is indicated to determine whether there is any advantage to be gained by altering usual cultural practices.

C. M.

SIMMONDS, F. J. — **Biological control — past, present and future.** *J. Econ. Ent. 52 (6) : 1099 — 1102.*

The author, head of the Commonwealth Institute of Biological Control, considers that in the future there will be more, not less, scope for the use of biological methods to control injurious insects which have spread from their original habitat. Despite increasing rigidity of quarantine laws and inspection services, the accidental introduction of pests into new areas continues, particularly as a result of the facility and speed of air transport.

Great expansion is indicated in the use of micro-organisms of various types in the control of pests.

J.R.W.

HURPIN, B. (1961) — **La lutte microbiologique contre les insectes.** *Cah. Ing. Agron.* No. 154 : 21—27.

The use of bacteria and viruses to control insect pests is discussed. The rational use of insect diseases to control agricultural pests presents many difficulties at present but the results of research in progress are encouraging. An important point is that the employment of a disease agent may give different results depending upon the way it is used. *Bacillus thuringiensis,* discovered in 1912, is one of the most promising of microbes for the control of lepidopterous pests.

J.R.W.

C. CRAPLET. — **La vache laitière : reproduction, génétique, alimentation, habitat, grandes maladies.** — Vigot Frères, Paris, éd., 1960. Col. « Traité d'élevage moderne V ».— Un vol. 488 p., 73 fig., tabl.— Prix : NF 45.

En écrivant ce cinquième tome de son « Traité d'élevage moderne », l'auteur s'est proposé de réaliser une synthèse entre les diverses questions — alimentation, techniques d'élevage et d'exploitation, génétique, pathologie — qui récemment encore restaient séparées, chaque spécialiste ayant une optique propre à ses préoccupations et négligeant les domaines voisins Actuellement, ces barrières artificielles s'effacent devant un autre problème : celui de l'économie et de la rentabilité, obligeant chaque spécialiste à pénétrer dans les autres domaines. Rédigé dans une forme simple, ce tome contribuera à répandre quelques vérités premières inutilité de nourrir coûteusement une vache dont le potentiel laitier est mauvais ; de soigner médicalement des mammites si la technique de traite est défectueuse. Danger d'employer de la craie pour lutter contre la déminéralisation, celle-ci résultant d'un excès de calcium par rapport à un manque de phosphore ; d'utiliser la tuberculine pour détecter la tuberculose sans connaître les limites de cet instrument biologique très imparfait. Nécessité d'assurer la rentabilité d'une production laitière en conjugant : bon génotype, alimentation équilibrée, techniques correctes de production, prévention rationnelle des maladies.

N. I. KOVALEV. **Le transfert d'humidité et son influence sur l'extraction des substances solubes lors de la cuisson des légumes et sur la formation d'une croûte lors de leur friture** (*En russe*). Vopr. Pit., 1960 (XIX) N° 5, Sept.-Oct., 62-66, 1 fig., 4 tabl , 8 réf.

L'immersion des légumes dans une eau bouillante amène un transfert de l'humidité des régions périphériques vers l'intérieur, entraînant les principes alimentaires hydrosolubles. — Ce transfert dure tant que la température des assises superficielles est supérieure à celle du centre — Après, un mouvement en sens inverse s'effectue, avec possibilités de pertes en substances nutritives. — Lors de la friture le même processus se produit, mais la formation d'une croûte imperméable dans les couches superficielles empêche ces pertes de se produire.

EVANS, A.C. — **Studies of intercropping I : Maize or sorghum with groundnuts.** Études sur les cultures en mélange. I : Maïs ou sorgho et arachides.

E. Afr. Agric. For. J., 26 (1) : 1-10, July 1960.

Les essais de comparaison entre culture à l'état pur et en mélange ont généralement porté au Tanganika sur une seule culture comparée avec cette même culture associée à une autre. Ceci a rendu difficile une comparaison rigoureuse des 2 systèmes. Le problème est pourtant important car si la culture en mélange, traditionnellement utilisée dans le pays, présente des avantages décisifs en l'état actuel des techniques agricoles locales, la mécanisation exigerait la pratique de cultures à l'état pur.

L'auteur présente les résultats de 3 essais : 2 sur maïs et arachide et un troisième sur sorgho et arachide.

Toutes les combinaisons de populations denses (H) moyennes (M) et basses (L) des deux cultures ont été plantées en mélange et à l'état pur. Les expérimentations ont été poursuivies en 1957 et 1958 en deux lieux. Dans le premier, le sol est peu fertile et la pluviométrie faible et mal répartie alors que dans le deuxième, les circonstances sont plus favorables à ces deux points de vue.

Les résultats de ces essais montrent qu'en général on obtient une production globale plus importante pour les cultures en mélange. L'exception la plus caractéristique à cette règle a été observée dans un des essais en 1957 où la pluviométrie fut particulièrement favorable.

Il n'a pas été possible de procéder à des observations (influence de l'ombrage, humidité du sol) qui permettent une interprétation du profit tiré par les plantes de leur association. On a cependant pu observer que l'ombrage du maïs ne portait pas préjudice, (contrairement à ce que l'on aurait pu penser), à la végétation de l'arachide

En 1957 on a trouvé, pour un essai, une régression négative significative entre les rendements des arachides et ceux des maïs qui leur étaient associés, mais ces résultats n'ont pas été reproduits en 1958.

Par contre, pour les 2 années et les deux essais, on a pu obtenir des régressions significatives entre le rendement de l'arachide et la densité de population du maïs (ou du sorgho). Une relation du même ordre a pu être observée entre la densité d'arachide et le rendement du maïs (mais non celui du sorgho).

Par extrapolation de ces régressions on a pu trouver que l'action d'une faible densité de maïs sur le rendement de l'arachide était beaucoup plus importante dans de mauvaises conditions pédologiques et climatiques que dans un milieu plus favorable. Sur la base de ces études on peut évaluer à 48 lb acre la perte d'arachide due à une augmentation de 1000 pieds acre de la densité de maïs et à 23 lb/acre la perte due à 1000 pieds supplémentaires acre de sorgho.

Les rendements ont été réduits par les mauvaises herbes poussant dans l'interligne dans les mêmes proportions que par la conduite d'une autre culture.

CHAMINADE, R.— **Les bases de la fumure potassique.**
Bull. Assoc. Franç. Et. Sol., (8) : 402-409, Août 1960.

Le potassium se rencontre en quantités variables dans les plantes cultivées et il convient de distinguer prélèvements et exportations, ces dernières correspondant aux quantités qui sortent réellement de l'exploitation et ne font pas retour au sol.

Le sol devra renfermer une quantité de potasse "disponible" correspondant aux besoins de la plante la plus exigeante.

Il a été souvent montré que l'absorption de la potasse n'a lieu que pendant une partie de la période de végétation de la plante : il faudra donc que les réserves du sol soient suffisamment élevées pour faire face à l'intensité de l'alimentation pendant cette période. Le sol devra donc posséder un "fonds de roulement" potassique qui sera entretenu en compensant les exportations et les pertes par drainage : ces dernières correspondent à environ 15 kg/ha en sol de limon. L'entretien des réserves exigera des apports essentiellement variables suivant le système de culture.

La forme du potassium qui est la plus importante du point de vue nutrition potassique des plantes est le potassium échangeable.

Dans le sol en place, le potassium se rencontre à la fois dans la phase liquide et dans la phase solide : la concentration en potassium de la solution résulte d'un équilibre entre cette solution et le potassium fixé.

La concentration de la solution du sol en potassium est un facteur important de l'alimentation potassique, mais il est difficile d'évaluer d'une façon précise cette concentration. Un deuxième facteur est la possibilité de renouvellement du titre en potassium de la solution à partir des réserves du sol.

L'assimilabilité du potassium dépend des conditions dans lesquelles il est fixé : ainsi pour une même teneur en potassium échangeable, ce potassium sera plus facilement cédé par un sol peu argileux que par un sol plus argileux.

La fumure potassique devra atteindre un double but :

1) assurer dans le sol un niveau suffisant de réserves facilement mobilisables afin de faire face aux besoins de la plante en période de pointe (fumure de fond) ;

2) ce niveau étant atteint, le maintenir en compensant les exportations (fumure d'entretien).

Mars 1961

A. Pluie (pouces) et différences de la normale

Période	Ouest	Nord	Est	Sud	Centre
1 — 5	1.62	0.83	1.69	1.83	1.55
6 — 10	5 89	1.24	2.42	1.06	2.74
11 — 15	0.12	0.67	1.70	0.67	0.96
1 — 15	7.63 (+3.21)	2.74 (—1.61)	5.81 (—1.03)	3.56 (—2.79)	5.25 (—1.59)
16 — 20	1.57	0.79	1.83	0.51	2.44
21 — 25	1.90	1.21	2 96	1.79	2.26
26 — 31	0.19	0 42	1.02	0.32	0.08
16 — 31	3.66 (—0.74)	2.42 (—2.01)	5 81 (—1.34)	2.62 (—3.91)	4.78 (—1.91)

B. Température (°C)—Maximum, minimum et différences de la normale

1 — 15	32.6 22.0	30.4 (—0.1) 22.2 (+0.6)	28.7 21.2	30.1 (+0.4) 21.9 (+0.3)	28 1 (+1.0) 20.2 (—0 5)
16 — 31	32.0 22.4	30.0 (—0.2) 22.7 (+1.5)	28.3 21.9	29.6 (+0.3) 22.8 (+1.2)	27.9 (+1.1) 20.7 (+0.3)

C. Vélocité (nœuds*). Moyenne quotidienne des vélocités horaires les plus élevées et maximum horaire

1 — 15	7 (10)	6 (9)	6 (8)	11 (16)	7 (12)
16 — 31					

*Pour convertir en milles à l'heure multiplier par 1,151.

STATISTIQUES DES CONDITIONS MÉTÉOROLOGIQUES

Avril 1961

A. Pluie (pouces) et différences de la normale

Période	Ouest	Nord	Est	Sud	Centre
1 — 5	0.05	2.08	1.96	1.93	2.31
6 — 10	1.38	2.18	4.12	2 76	1.59
11 — 15	0.40	1.22	0 44	1.84	0.99
1 — 15	1.83 (—0.89)	5.48 (+ 1 89)	6.52 (+0.51)	6.53 (+0.69)	4.89 (—0.38)
16 — 20	0.19	0.29	0.34	1.08	0 60
21 — 25	0.05	0.80	1.00	1.08	0.72
26 — 30	1.88	0.23	0.20	0.06	0.83
16 — 30	2.12 (+0.18)	1.32 (—1.69)	1.54 (—3.70)	2.22 (—3.10)	2.15 (—2.16)

B. Température (°C)—Maximum, minimum et différences de la normale

1 — 15	31.7 22.2	29.7 (—0.1) 21.6 (+0 9)	28.6 21.0	29.4 (+0.7) 21.8 (+0.4)	28 0 (+2.0) 20.4 (—0.1)
16 — 30	32.1 21.9	29.7 (+0.7) 21.4 (+1.5)	27.9 20.2	29.0 (+1.0) 21.0 (—0.1)	27 6 (+2.5) 19.8 (+0.4)

C. Vélocité (nœuds*). Moyenne quotidienne des vélocités horaires les plus élevées et maximum horaire

1 — 15	7 (10)	7 (8)	5 (7)	10 (13)	6 (10)
16 — 30	5 (10)	6 (10)	5 (8)	10 (12)	6 (10)

*Pour convertir en milles à l'heure multplier par 1,151.

(A)

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(B)

(C)

(D)

(E)

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(A) *Below :* Cleaning Evaporator Tubes with a Twin Drive Machine at a Sugar Refinery.

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(B) *Below :* Removing Scale from Babcock & Wilcox Boilers in an Indian Refinery.

(C) *Below :* Cleaning the tubes of horizontal Juice Heating Plant in an Indian Sugar Factory.

(D) 'Skatoskalo' Electric, Petrol-Driven and Pneumatic Machines, rotary Scaling tools, wire brushes etc., are designed to do routine cleaning and descaling work quickly, positively and thoroughly.

(E) *Left :* Operating two machines simultaneously of the cleaning of an evaporator.

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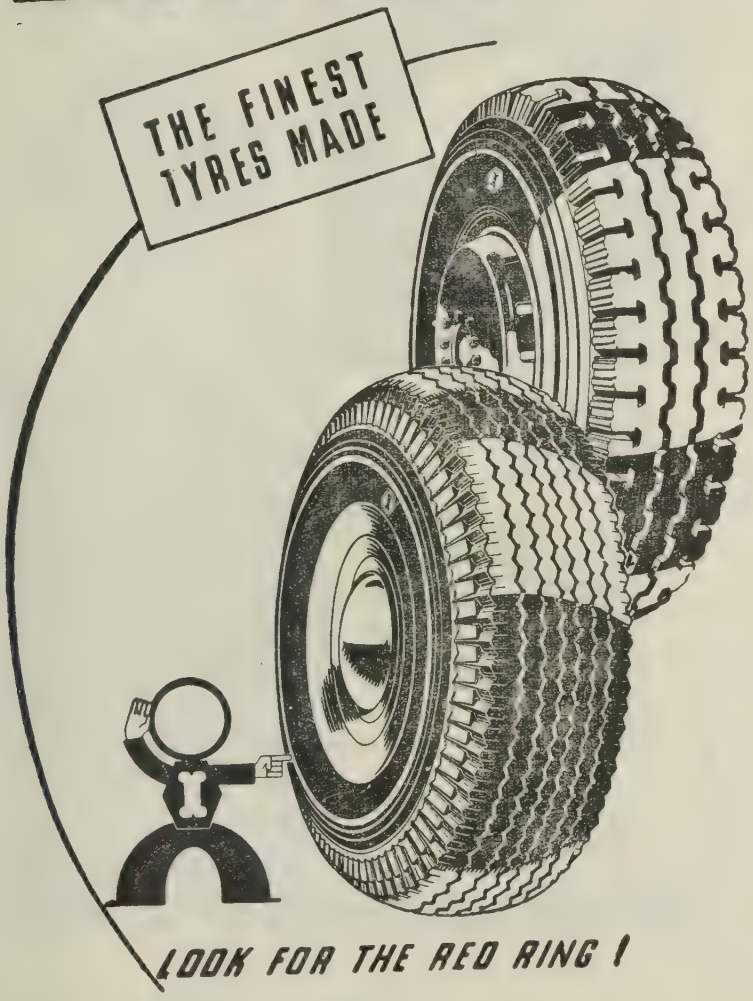

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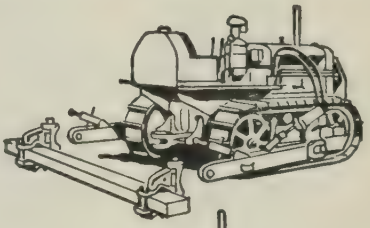

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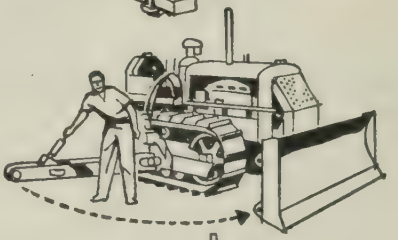

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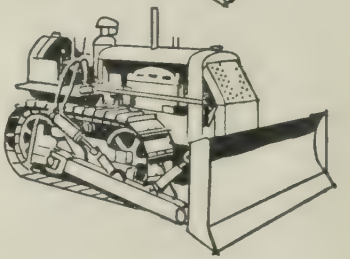

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